Metals Review
THE NEWS DIGEST MAGAZINE
Published by the American Society for Metals
Volume XXIII - No. 7 July 1950

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Metals Review

THE NEWS DIGEST MAGAZINE

VOLUME XXIII, No. 7 **JULY, 1950**

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Thermodynamics in Physical Metallurgy

This seminar was given under the auspices of the Society and arranged through the ASM Seminar Committee consisting of the following members: M. Gensamer, Chairman; R. M. Brick, J. H. Hollomon, Morris Cohen, C. Zener, and L. R. Jackson. Dr. Clarence Zener, University of Chicago, was the coordinator of the Seminar, and took a most active part in the entire selection of authors and papers. The two-day meeting, which preceded the opening of the Metal Congress, was attended constantly by more than 500 leading metallurgists and physicists in this country. The material presented was of such high character that it was deemed by the board of trustees as necessary to be retained in the permanent records of the Society. The board authorized the publication of this material to be made available to the members in book form at a price sufficient to cover only the cost of production.

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The Principles of Thermodynamics, by P. W. Bridgman, Harvard University; Contributions of Statistical Mechanics, by C. Zener, Institute for the Study of Metals, University of Chicago; Application of Thermodynamics to Heterogeneous Equilibria, by L. S. Darken, U.S. Steel Corp.; Application of Electromotive Force Measurements to Phase Equilibria, by F. J. Dunkerley, University of Pennsylvania; Some Physical Interpretations of Constitution Diagrams, by A. W. Lawson, Institute for the Study of Metals, University of Chicago; Thermodynamics of Liquids, by John Chipman, Massachusetts Institute of Technology, and John F. Elliott, U.S. Steel Corp.; Physical Factors Affecting Order, by C. E. Birchenall, Carnegie Institute of Technology; Nucleation, by J. H. Hollomon, General Electric Co.; Precipitation, by Charles Wert, Institute for the Study of Metals, University of Chicago; Eutectoid Decompositions, by John Fisher, General Electric Co.; Martensite Transformations, by Morris Cohen, Massachusetts Institute of Technology; Magnetic Domains, by Lieuwe Dijkstra, Institute for the Study of Metals, University of Chicago; Principles Governing Solidification, by D. Turnbull, General Electric Co.; Role of Thermodynamics in Metallurgical Research, by J. B. Austin, U. S. Steel Corp.

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Edited by John T. Burwell, Jr., *Associate Professor*
Department of Mechanical Engineering
Massachusetts Institute of Technology

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CHAPTER CONTENTS

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METALS REVIEW (4)

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New England Regional Meeting at New Haven

Reported by R. P. Nevers
American Brass Co.

The New England Regional Meeting of the American Society for Metals was held in New Haven, Conn., on May 12, with 350 members present from the Boston, Hartford, New Haven, Rhode Island, Springfield and Worcester Chapters. Henry L. Burghoff of the New Haven Chapter was general chairman of the meeting.

The program opened in the forenoon with conducted visitations to the Ansonia Branch of American Brass Co., and to the Detroit Steel Co., Hamden. In the afternoon the High Standard Manufacturing Co. and Yale University were visited.

The late afternoon technical session was addressed by D. K. Crampton, research director, Chase Brass & Copper Co., whose subject was "Factors Determining Brass Strip Rolling Reductions", and by Charles D. Kellogg, of the New England Council, on "The Future of Steel Production in New England".

Dr. Crampton discussed the various factors entering into the selection of suitable individual roll passes and series of reductions between anneals for brass strip. Control of these operations in modern mill practice is of great importance, as is also the utilization of high production units and mechanical handling. Results of in-process measurements of total rolling load, unit resistance to deformation, power consumption, directional properties, and related phenomena were also outlined by Dr. Crampton.

New England, Mr. Kellogg said in his portion of the program, is the largest important industrial region of the United States not possessing an integrated steel mill; it now has a nonintegrated steel production of only 350,000 annual tons, most of which is in specialties. Against the background of these facts, a comprehensive research program was proposed in 1947 to determine the economic feasibility of establishing an integrated steel mill on the coast of New England to be supplied largely by water-borne raw materials.

Mr. Kellogg's data demonstrated that a steel mill probably could be operated justifiably and on an economically sound basis. The New England Steel Development Corp. was formed early this year and has undertaken further engineering surveys based on the New London area.

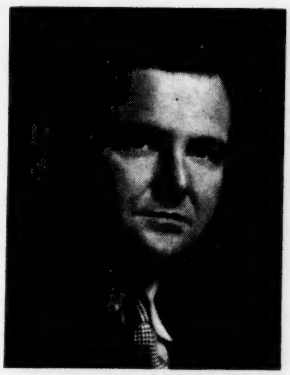
Mr. Kellogg stated confidently that "Steel will be made in New England only if steel can be made and sold as cheaply as in existing steel centers. This, we fully believe, will be proven true." He further stated, "If our calculations are correct, there will arise, probably in New London, the world's most modern fully integrated steel mill employing some 3,000 to 4,000 men turning out almost one million tons of raw and semi-finished steel annually. Such a plant would supply thousands of existing plants in the Northeast and attract like a magnet new metal-using industries to provide from 30,000 to 50,000 new jobs throughout New England."

The banquet speaker was Miss Vivien Kellems, president of the Kellems Co. With inherent charm she described her recent skirmishes with the Government regarding the tax laws, especially the principle of the withholding tax which has won her ardent support in many quarters.

The members received the pleasant and appropriate greetings of National President Focke and Secretary Eisenman.

Speakers' Table at the New England Regional Meeting in New Haven Included, From Left: M. H. Knapp, Chairman, Rhode Island Chapter; Horace Ross, Chairman, Boston Chapter; W. H. Eisenman, National Secretary; Miss Vivien Kellems, Banquet Speaker; C. B. Christensen, New Haven Chapter, Presiding Chairman; Arthur E. Focke, National President; Michael Kober, Chairman, New Haven Chapter; R. S. Morrow, Vice-Chairman, Worcester Chapter; and J. A. Tinsman, Chairman, Springfield Chapter

Former Secretary Dies



Ashley & Crippen

A Former Secretary of the Ontario Chapter A. S. M., Thomas Brown Russell, President of the Acme Machine and Tools, Ltd., Died at His Home in Toronto on March 30 at the Age of 42. Mr. Russell was a director of Russell Industries Ltd. and Canadian Acme Screw and Gear Ltd.

Houghton Chairman Omitted

The following letter has been received from R. C. Stewart, assistant works manager, Pratt & Whitney of Canada, a past chairman of the Ontario Chapter A.S.M.:

"May we refer you to page 6 of the May issue of *Metals Review*, to an item captioned "The Reviewing Stand", in which you list the employees of E. F. Houghton & Co. who have served as chairman of A.S.M. local chapters. There is one omission which we would call to your attention, and that is J. W. Watson, a past chairman of the Ontario Chapter. I might add that Mr. Watson has been active in the society for over 25 years, and is still one of our most ardent enthusiasts."

Centennial to Be Celebrated

The University of Minnesota Institute of Technology will celebrate the University's 1950-51 Centennial with a three-day program Oct. 5 through 7, which will be highlighted by the dedication of three new engineering buildings on the campus. Alfred E. Cronk, assistant professor of aeronautical engineering, is chairman of the Institute's Centennial program.

Lightner Receives McFarland Award

M. W. Lightner (Left) Receives a Hand-Lettered Certificate From Prof. David Ford McFarland of Penn State College, in Whose Honor the Local A. S. M. Chapter Has Established This Award for Achievement in Metallurgy

Reported by Philip C. Barr, Jr.
Pennsylvania State College

The second annual David Ford McFarland Award was presented to M. W. Lightner, manager of the research and development division of Carnegie-Illinois Steel Corp., at a banquet meeting of the Penn State Chapter A.S.M. on May 5. Mr. Lightner then presented the technical lecture of the evening on "Speeding Metal Refining Operations"—a most timely subject, in view of the necessity for developing economic methods for refining steel from the lower-grade ores.

Steel costs have an important effect on the national economic structure, he pointed out, and keeping them down presents a challenge to the steel industry, in view of the rapid depletion of the high-grade ore resources available in this country.

The new Turbo-Hearth and the latest developments in Perrinizing experiments were also explained.

Numerous alumni from Mr. Lightner's period at Penn State were in attendance, as well as various associates at Carnegie-Illinois Steel Corp., including Messrs. E. C. Bain, M. A. Grossmann, M. Gensamer, R. B. Mears and R. W. Steigerwalt.

Atlantic Steel Co. Has Open House, Farm Show

A combined "Open House and Southern Agricultural Implement Show" was sponsored by the Atlantic Steel Co. in Atlanta, Ga., on May 5 and 6. This industrial pageant, carrying the theme of "Dixisteel on Dixie Farms", included opportunities to observe the manufacture of openhearth steel in the company's three 72-ton furnaces as a feature of the Open House, plus exhibits of farm implements by 35 southern manufacturers.

R. S. Lynch, president of Atlantic Steel Co., is a past chairman of the Georgia Chapter A.S.M., and Michael F. Wiedl, sales representative, has been secretary of the chapter for the past several years.

Unique Heat Treatments Used on Buick Parts

Reported by W. G. Davey
Algoma Steel Corp.

"Unique Heat Treatments of Automotive Parts" were outlined by Harold Maloney, materials supervisor of the Buick Motor Division, General Motors Corp., at the first annual meeting of the new Northern Ontario Chapter A.S.M. Under the headings of motor parts, conventional transmission, dynaflow transmission, and chassis parts, the speaker followed through the heat treatment of each part and told of the metallurgical and production problems involved.

The many aspects of modern heat treating techniques were touched upon and their significance to production methods was amply illustrated. The choice of steels for proper hardenability was discussed, and the advantages of salt bath quenches to eliminate distortion were shown by case histories of parts which had given trouble on straight draw and quench techniques.

Old-Timers Honored; Knowlton Is Speaker

Reported by H. H. Benninger
Peninsular Steel Co.

Monday, May 8, was a red-letter day in the 1950 calendar for the Detroit Chapter A.S.M. At this final technical meeting of the year, 50 Detroit "old-timers" were lauded by the entire assembly, and the technical talk was delivered by Harry B. Knowlton, Supervisor of Materials Engineering at the International Harvester Company, in his own rare form.

The old-timers gathered at a special table decorated in their honor to have dinner and reminisce about the early days in the automotive industry. This group, made up of A.S.M. members of 25 years or more standing, grows yearly, and thereby speaks well of the maturity of our organization.

The theme of Mr. Knowlton's lecture revolved about the selection of materials to do a job rather than meet an arbitrary set of physical standards. He cited many instances where eminent metallurgists, all of whom had selected materials which filled a given bill with complete satisfaction, could not agree among themselves on the physical properties which were required by the part. He repeatedly warned against the tendency to condemn proven materials on the basis of tests which do not measure the effect of the factors causing failure.

Mr. Knowlton then introduced Homer Kincaid, assistant works metallurgist of the International Harvester Farmall Works, who developed some of the methods used in induction hardening of small gears. Mr. Kincaid discussed a short excerpt from his own film on induction hardening gears in several Harvester plants.

H. B. Knowlton at Detroit

Testing and Inspection Used to Establish Specifications and Insure Conformity

Reported by Jack Dickason
Metal Control Laboratories

Directing his address in the main to the laboratory personnel, inspectors and engineers present, Donald S. Clark, associate professor of mechanical engineering, California Institute of Technology, covered the broad field of "Testing and Inspecting Products" in his address to the Los Angeles Chapter A.S.M. on April 27.

The practice of testing and inspecting is very old, as illustrated by Dr. Clark's reading of an ancient recipe for the heat treatment of Damascus blades which were subsequently tested by beheading a slave. This recipe also substantiates the contention that, in the final analysis, the best test of a product is its use and acceptance by the ultimate consumer! Laboratory testing and field inspection are used essentially to establish specifications and to insure conformity thereto.

Using a series of slides, the speaker compared the many testing devices used today with the testing machines developed by Galileo and Meusschenbrock. Modern procedures and equipment used in mass production nondestructive testing include instruments for dimension and surface measurements, fluorescent inspection, magnetic inspection, X-ray inspection, fluoroscopic and ultrasonic inspection.

Destructive testing methods include metallographic examinations, deep etches, etc.; mechanical tests such as tension, compression, bending, torsion, fatigue and hardness; chemical analysis; salt-spray corrosion and accelerated weathering tests.

Dr. Clark also pointed out the variables encountered in sampling procedure, and stressed the point that a test is only as good as the sample submitted.

Prof. Clark of Caltech

In conclusion, Dr. Clark elaborated on the use of "common sense" in laboratory testing and inspection; interpretation of results, he said, is usually the most important factor.

Alloy Plating Offers Field for Research

Reported by J. G. Cutton
Metallurgist
Carnegie-Illinois Steel Corp.

Electroplating was the subject of the Mahoning Valley Chapter's meeting of April 11. Leslie E. Lancy, president of Ellwood Electroplating, Inc., and the Lancy Laboratory, Inc., was the speaker.

Dr. Lancy touched upon the electroplating of almost all the metals in the periodic table. Alloy plating with cobalt-nickel, copper-zinc-lead-copper, lead-silver, and cobalt-tungsten was also discussed. Alloys which are completely immiscible in liquid state are now plated in a homogeneous alloy. Unusual properties are possible with such alloys and the field for research appears almost unlimited.

By using the electrolytic tin method instead of the older method of hot dipping for the tin plate industry, about ⅓ to ¼ less tin is used, and a more uniform deposit is obtained. Rhodium plating has been found to be superior to silver for high-grade mirrors.

Seated, at Right, Is Leslie E. Lancy, Who Addressed the Mahoning Valley Chapter on Electroplating. Left is J. E. Phillips, metallurgist, Cold Metal Products Co., and standing is Ray Justice, chapter chairman (Photograph by Henry Holberson)

Successful High-Frequency Heating Applications Shown

Reported by F. R. Morral
Department of Materials Engineering
Syracuse University

The General Electric Co. was host at its Electronics Park to the members of the Syracuse Chapter A.S.M. at the last technical meeting of the season. Arrangements for this visit to the new television tube plant were made by R. N. Gilmore.

Speaker of the evening was Richard A. Gehr of the induction and dielectric laboratories of General Electric Co., who presented an evaluation of high-frequency heating.

During the war many applications of induction and dielectric heating performed production miracles. However, there were also applications which were not good at all and caused more trouble than anything else. High-frequency heat is not a cure-all and careful analysis of each problem is necessary to assure proper application, Mr. Gehr pointed out.

Induction and dielectric heating methods have limitations from both application and economic viewpoints. Since heat transfer efficiency with high-frequency heat is usually 50% or less, there must always be improvement in production or quality of product, or reduction in direct labor costs or other savings to justify this type of heating. Numerous examples of successful applications were shown on slides and described with running commentary.

To be sure whether any new application of induction or dielectric heat is feasible, both application wise and from an economic point of view, a careful study of the problem is necessary, the speaker concluded.

Epstein Explains Aging Problems in Deep Drawing Sheet

Reported by H. L. Sittler
Metallurgist, Arcrods Corporation

When Samuel Epstein of Bethlehem Steel Co. spoke before the Baltimore Chapter A.S.M. on "Deep Drawing Steels", his command of the topic and the wealth of information which he had available was readily evident.

Low-carbon sheet steel is almost as drawable as brass and much more so than aluminum, Mr. Epstein explained. It is made of rimmed steel and is, therefore, subject to aging. To eliminate this aging, aluminum-killed steel was introduced about 15 years ago. This has good drawing properties, but the surface is not as good as that of rimmed steel. This points to a rimmed, non-aging steel for many uses.

Since nitrogen seems to be at least a strong contributor to aging, elements may be added which will combine with nitrogen but not with oxygen. Thus, aging can be restricted while the rimming action is not interfered with. Such an addition element is vanadium in amounts of about 0.05%.

Mr. Epstein described good and poor rimming steels and some of their characteristics, particularly as concerns the number of blowholes present and the "rising" or "falling" of a rimmed steel ingot. As much care must be used in making a good rimming steel as in making the so-called higher quality steels, he said.

Aging steel has a higher tensile strength at 400° F. than at room temperature, while a nonaging steel has a lower tensile strength at 400° F. than at room temperature. Tests at room temperature may not, therefore, give accurate information as to the steel's performance. If the "aging coefficient" is positive the steel is of the aging variety; if the "aging coefficient" is negative, the steel is nonaging. As an example, the top cuts of a vanadium-treated rimming steel had an average aging coefficient of −5900, while the bottom cuts had an average aging coefficient of −7000.

The microstructure of cold rolled, annealed, and skin rolled (1 to 2%) sheet consists of equiaxed grains in the vanadium-treated rimmed steel and of elongated grains in an aluminum-killed steel. Less cold reduction is permissible on the aluminum-killed steel to give optimum grain structure. Preferred grain orientation may be controlled by finishing temperature in the hot mill, as may also the arrangement of the carbides. For thin-gage sheet, the fine grain resulting from single-thickness continuous annealing gives better drawability and better "uniform elongation" than does the pack-annealed sheet, despite the higher hardness of the sheet continuously annealed in a single thickness.

(Courtesy Wheelco Instruments Co.)

What Wise Guy's Been Monkeying With This Temperature Recorder?

Wichita Has Ladies Night

Reported by R. E. Samuelson
Beech Aircraft Corp.

"Ladies Night" was held by the Wichita Chapter A.S.M. on May 16, when a buffet supper was given for the members and their wives. This was followed by a short business meeting and election of new officers, whose names will be listed in the August issue of *Metals Review*.

After the meeting two movies were shown entitled "You Can Change the World" and "More Precious Than Gold".

Rockford Members Inspect Wire Manufacture, Motors

Reported by Wilhelm Olson
Atwood Vacuum Machine Co.

The American Steel and Wire Co. and Johnson Motors of Waukegan, Ill., were hosts for two plant inspection trips sponsored by the Rockford Chapter A.S.M. on April 26.

The American Steel & Wire Co. was visited in the afternoon. This plant, a subsidiary of U. S. Steel Corp., produces wire of all sizes ranging from less than 0.010 in. up to ¾ in. diameter. Fifty-five different sizes of rods in 130 different steels are required to meet the multitude of specifications set up by its customers. The plant draws wire from carbon steel, stainless, copper, bronze, aluminum, and various coated rods.

All factory departments, including the spring division, were visited and the operations carefully explained. The host company topped off the visit with a tasty meal, after which the group departed to pay a visit at Johnson Motors, whose products interest particularly the sportsman.

Outboard motors ranging in size from 2½ to 22 h.p. are produced here. A great number of manufacturing processes are involved and a fine system of quality control is very much in evidence. Of great interest to the group was the die-casting operation, which is a very important one in the Johnson production line.

Talks on Forming of Aluminum

E. H. Dix (Center), Assistant Director of Research of the Aluminum Co. of America, Talked on "Forming and Working Aluminum and Aluminum Alloys" Before the West Michigan Chapter A.S.M., March Meeting. At left is A. W. Demmler, past chairman, and at the right, E. R. Good, present chapter chairman. (Reported by J. V. Norris, Diesel Equipment Div., G.M.C.)

Three Phases of Bessemer Process Featured

Reported by R. M. Allen
Carnegie Illinois Steel Corp.

Discussions on three phases of bessemer steel production featured the Sustaining Members Night program of the Pittsburgh Chapter A.S.M. E. P. Best, assistant chief metallurgist of A. M. Byers Co., F. L. Toy, assistant to manager, research and development division of Carnegie-Illinois Steel Corp., and A. B. Wilder, chief metallurgist of National Tube Co., were the speakers.

Mr. Best's talk dealt with desulphurization of hot metal used as a step in the production of wrought iron by the Byers process. In the original method of desulphurizing, sodium carbonate was shoveled into a ladle prior to tapping hot metal from a cupola. The slag formed on the top of the metal was hand-skimmed before transferring the metal to a converter. With several refinements of this method, including the use of two ladles, up to 82% of the sulphur was eliminated.

Further development of the process was the introduction of sodium hydroxide and a three-ladle continuous process which eliminates 90 to 94% of the hot-metal sulphur. In the three-ladle process, 27,000 lb. of hot metal is tapped into a tapping ladle, with the simultaneous addition of 250 to 400 lb. of solid sodium hydroxide. The metal then goes into a hooded ladle. The hood skims off the slag as the metal is poured into a transfer ladle, through a nozzle at the top just below the hood. Figures from the Byers Co. production records revealed the effectiveness of this desulphurization technique.

Mr. Toy described the development of the basic-lined surface-blown hearth for the production of steel. This process differs from the conventional bessemer method in the application of the air across the surface of the bath rather than through the bath. This principle applied to the basic process results in the development of higher temperatures, due to the combustion of the carbon monoxide to carbon dioxide, the removal of phosphorus and the low nitrogen content of the steel.

Mr. Toy described a 1000-lb. pilot furnace. It has a magnesite bottom with jet pipes in the side through which air at pressures from 25 to 48 oz. per sq. in. is blown. The average time consumed per heat was 12 min., with phosphorus and sulphur removal up to 97% and 50% respectively.

Dr. Wilder concluded the evening's program by showing a series of color slides of the new plant of National Tube Co. at Lorain, Ohio, and also of the McKeesport plant. Various stages of a bessemer blow were realistically depicted in color. The steel produced at both of the plants is processed into seamless tubing or pipe.

Part of the Speakers' Table at the Pittsburgh Chapter Shows, at Extreme Left, E. P. Best of A. M. Byers Co., One of the Speakers; Third From Left, E. L. Solomon, President, Max Solomon Co.; Chapter Chairman George A. Roberts; D. R. Loughrey of Jones & Laughlin Steel Corp., Discussion Leader; and A. B. Wilder, National Tube Co., One of the Speakers

Dr. Wilder showed the differences in processing or deoxidation of open steel in a converter as compared to the production of killed steel. Additions of manganese and aluminum are made to the open or capped steel after pouring from the converter, while hot metal, manganese and silicon are added to the killed steel. The killed steel is poured in open-top molds and is watered after teeming to cause rapid solidification of the top.

A lively discussion of the three papers ably led by D. R. Loughrey, superintendent of openhearth and bessemer division of the Pittsburgh Works, Jones and Laughlin Steel Co., closed the technical session.

12,420 Steel Buyers ARE COMING TO CHICAGO

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Aluminum Becomes No. 1 Nonferrous Metal Based On Volume Production

Reported by Howard E. Boyer
Chief Metallurgist
American Bosch Corp.

"New Developments in the Engineering Materials Field" formed the subject of the talk presented before the Springfield Chapter A.S.M. at the May meeting. The talk was given by H. R. Clauser, managing editor for *Materials & Methods.*

There are four distinct areas of activity in the materials engineering field worthy of special mention, according to Mr. Clauser—namely, (*a*) the broad shifts in the economics of materials and the emergence of light metals to a higher level of importance; (*b*) continual improvement in the properties of the older available materials; (*c*) the development of new materials to meet newly created technical demands; and (*d*) development of fabricating and processing techniques.

Mr. Clauser presented numerous figures showing how consumption of the light metals is tending to exceed the supply. He pointed out in particular that aluminum has emerged as No. 1 nonferrous metal on a volume basis and is close to first on a weight basis. At present magnesium seems to be in somewhat of a slump, perhaps partly because of "overglamorization".

Improved materials include the newer free-cutting steels and the recent developments in gray iron castings. Titanium, plastics and the metalloid combinations might be considered as new materials.

Improvements in processing include fabrication by powder metallurgy, precision casting, precision forging, and the newer methods of extrusion, both hot and cold.

New Stainless Researches Described

Carl Zapffe (Second From Right) in a Characteristic Pose During the Informal Discussion That Followed His Talk on Stainless Steel at Boston

Reported by Sidney H. Baylor
Eastern Appliance Co.

"Stainless Steels" was the title of an address delivered by Carl A. Zapffe, consulting metallurgist, immediately following the installation of Peter P. Kosting as chairman of the Boston Chapter A.S.M. at its May 5th meeting.

The evening's program was preceded by a plant visitation to the Draper Corp. at Hopedale, Mass., leading manufacturers of textile machinery, a dinner in the plant cafeteria, and the annual election of officers.

Basing his presentation principally upon slides taken from his recent A.S.M. book on stainless steels (which has just been rated by a national poll as one of the 100 best scientific books published in 1949), Dr. Zapffe carefully described the metallurgical principles underlying the development of these splendid alloys.

First, he described how and why they are "steels", and then he described how, why, when, and where these steels are "stainless"—an adjective which must be used with considerable discernment, for stainless steels do not resist corrosion because they are chemically noble, like gold and platinum, but because they possess a peculiar feature, not yet well understood, which vastly retards corrosion.

In the latter portion of his address, the speaker departed from the methodical presentation in his book to describe the results of certain new researches conducted in his private laboratory the past several years under contract with the Office of Naval Research. These studies show by means of "fractographs" the effect of chromium content upon the microscopic architecture within the individual grain and upon the toughness of the metal and its resistance to fracture by impact.

Also, since an important part of the speaker's researches on gases in metals has concerned hydrogen in stainless steel, slides were presented illustrating embrittlement resulting from pickling and electroplating stainless steels. Several precautions in the handling of susceptible grades were advised; and it was suggested that the hardenable stainless steels have considerably better ductility than commonly believed, and that an important loss of ductility occurs in plant operations because of hydrogen inadvertently picked up during processing of the steel.

In conclusion, data were presented from recent work under the Office of Naval Research which showed that the steam present in heat treating atmospheres reacts with stainless steels often to damage considerably their mechanical properties, particularly their ductility. His experiments showed that steam can cause greater hydrogen pickup than an atmosphere of pure gaseous hydrogen itself, and that even ordinary atmospheres contain sufficient moisture in the form of humidity to reduce seriously the ductility of some of the more susceptible grades.

Perhaps Dr. Zapffe's best slide was his closing one—a gruesome caricature suggestive of Lucifer himself, and entitled: "Inventor of Federal Specifications".

Radioactive Materials Available

St. John X-Ray Laboratory, Califon, N. J., has been authorized by the A.E.C. Isotopes Division, Oak Ridge, Tenn., to handle cobalt-60 on a rental basis. This and other radioactive materials may also be purchased outright if desired.

York Gets Lesson On High Speed Steel From One of Its Own

Reported by A. Floyd Whalen
Consulting Metallurgist

The annual Gettysburg meeting of the York Chapter A.S.M. on April 19 was addressed by J. G. Morrison, a past chapter chairman and chief metallurgist of the Landis Machine Co. of Waynesboro, Pa., on "Present-Day High Speed Steels and Their Heat Treatment".

Starting with a historical review of high speed steels, Mr. Morrison quoted from F. W. Taylor's address before the A.S.M.E. in 1906. Taylor's statement that ""Molybdenum can be substituted for tungsten in modern high speed steels, and one part of molybdenum will produce approximately the same effect as two parts of tungsten" was the mathematical key to nearly all subsequent developments of molybdenum high speed steels.

The speaker covered the various types of present-day steels from the 18-4-1 type to the super high speed steels with their high contents of vanadium and carbon. Care is required in heating the molybdenum high speed steels in atmosphere furnaces, and erratic results can be traced to decarburization or carburization.

The modern electrode salt bath furnace for heat treatment of tool-steel has developed progressively from alloy pots with a three-month life to ceramic pots lasting from one to two years, and from the open-electrode type to the totally immersed type. Accompanying improvements in sludging requirements and in the neutrality of the bath were noted.

Relative machinability, grindability, carburizing and decarburizing tendencies, grain growth, red hardness, movement in heat treatment and the economics involved in usage of the tungsten and molybdenum types of high speed steel were covered by the speaker.

Contrary to expectations, the usual atmosphere employed in hardening 18-4-1 steel is oxidizing even though it may contain as much as 12% carbon monoxide, he pointed out. Also in a steel containing more than 11% tungsten, carbon is absorbed at the surface in hardening. This is true with the moderate superheat time cycles that are employed in the heating of most tools.

For the small user of high speed steel, salt baths are not practical because the cost per pound of steel treated is excessive. The small shop is therefore dependent on atmosphere furnaces and should use the tungsten high speed steels preferable under such circumstances.

Indiana Chapters Sponsor Symposium

Speakers at the Annual Spring Symposium of the Combined Indiana Chapters of A.S.M. Are Shown in the Front Row, Seated. From left, they are: H. B. Knowlton, J. V. Russell, H. W. McQuaid, J. L. Goldthwaite, and R. J. Peters. In the rear are (left to right): Arthur E. Focke, A. S. M. national president and technical chairman of the meeting; J. T. McCormack, chairman of the Purdue Chapter; K. Hazeldine, member of the Terre Haute Executive Committee; G. Jennings, chairman of the Fort Wayne Chapter; E. W. Taylor, Calumet chairman; and J. W. Watson, Indianapolis chairman

Reported by
Stephen A. Minton, Jr.
Allison Division, G.M.C.

The Indiana Annual Statewide Spring Symposium of A.S.M. attracted 230 enthusiastic members and friends to the Purdue University campus on April 22. The symposium was presented cooperatively by the Calumet, Fort Wayne, Indianapolis, Muncie, Notre Dame, Purdue, and Terre Haute Chapters. This all-day meeting was devoted to the subject of "Selection of Steels for Mechanical Properties". Speakers and their topics were:

"An Engineering Approach to the Selection of Steels", by H. B. Knowlton, supervisor of materials engineering, International Harvester Co.

"Mechanical Properties of Steels Utilized as Rolled, Forged or Cast", by J. L. Goldthwaite, technical consultant to the chief metallurgist, Allison Division, General Motors Corp.

"Carbon Steels", by H. W. McQuaid, consulting metallurgist.

"Alloy Steels Commonly Used", by J. V. Russell, director of metallurgical laboratory, Chicago district, Republic Steel Corp.

"Surface Hardening Treatments", by R. J. Peters, chief metallurgist, Warner Gear Division, Borg-Warner Corp.

Arthur E. Focke, A.S.M. national president, acted as technical chairman for the two sessions. A buffet luncheon was served between the morning and afternoon meetings, each of which was followed by lively discussion period refereed by Dr. Focke.

IMPORTANT MEETINGS
For August

Aug. 14-16—Society of Automotive Engineers. West Coast Meeting, Biltmore Hotel, Los Angeles. (John A. C. Warner, secretary and general manager, S. A. E., 29 West 39th St., New York 18).

Aug. 14-16—Third Western Packaging Exposition, San Francisco Civic Auditorium, San Francisco.

Aug. 28-31—American Mining Congress. Metal Mining Convention and Exposition, Fairgrounds, Salt Lake City, Utah.

Italian Metallurgists to Meet

The Fourth National Congress of the Associazione Italiana di Metallurgia (Italian Society for Metallurgy) will be held at Florence, Italy, Sept. 28 through Oct. 1, 1950. The first day's program will be devoted to "Pure Metals", the second to "Metallurgical and Engineering Aspects of Machining", and the third to papers on various subjects. Further information may be obtained from the Associazione Italiana di Metallurgia, Via San Paola 10, Milano, Italy.

Foresees Industrial Place for Ductile Iron Despite Present Expense of Production

Reported by Alexander Lesnewich
Rensselaer Polytechnic Institute

Ductile cast iron may be defined as an iron in which graphite assumes a spherical instead of a flake form, according to Prof. Howard F. Taylor of Massachusetts Institute of Technology. Professor Taylor treated this new material from both a technical and a practical standpoint, speaking at a joint meeting of the Eastern New York Chapter A.S.M. and the American Foundrymen's Society on April 18.

Since the only unusual requirement of the melt is a sulphur content of less than 0.02%, the iron can be produced in most furnaces now making normal cast iron, Professor Taylor stated. The spherical graphite of ductile cast iron is formed by alloying the molten metal with cerium, magnesium, or calcium. Since cerium is expensive and calcium is difficult to dissolve, magnesium is the only commercially practical alloy addition at the present time.

Although not as strong or as tough as steel, ductile cast iron does approach its properties and, similarly to steel, can be produced with a ferritic, pearlitic, martensitic, or austenitic matrix. This material can take full advantage of ferrite strengtheners such as copper and nickel, but the phosphorus content must be kept low to attain optimum properties. Although it is more fluid than any ferrous metal, the shrinkage in cooling is so extensive that steel casting techniques are necessary. Ductile cast iron machines better than gray irons of similar strength.

Most foundries will find this metal expensive to produce, Professor Taylor emphasized, since more than average quality control is essential, education in treating the metal is required, and melting royalties are imposed.

Thus, ductile cast iron does not have a clear place in the field of engineering alloys at present but, since it is tougher than malleable iron and easier to produce than steel castings, the metal should find many uses in industry in the near future.

Urges Theoretical Rather Than Practical Approach To Metallurgical Education

Reported by L. P. Lee
Joseph T. Ryerson & Son, Inc.

"Metallurgical Education, Practical Versus Theoretical" was argued by Robert M. Brick, director, department of metallurgy, Towne Scientific School, University of Pennsylvania, before the final meeting of the 1949-50 season of the Chicago Chapter A.S.M. on May 8.

Dr. Brick contrasted the modern analytical approach to metallurgy with the older descriptive approach as exemplified in an 1876 catalog: "Practical instruction in mining and metallurgy (etc.) is not only indispensable but takes precedence over merely didactic and theoretical tuition once accounted a sufficient supplement of a liberal education."

The "practical" curriculum now found in many schools, Dr. Brick explained, emphasizes specific knowledge of typical industrial processes, whereas the "theoretical" program emphasizes mathematics, physics, physical chemistry and basic engineering applied to metal systems. He questioned whether colleges must educate men at two levels—one for industry, and a separate level for research. Dr. Brick believes the theoretical program is the best approach, since it prepares men for industry as well as for sales or production. However, arguments both pro and con can be advanced.

Paramount importance should be attached to the ability, enthusiasm, interest and approach of the teacher. He may and should develop the student's ability with written and oral English, as well as with organization and analyses of data.

In conclusion, Dr. Brick said, while a college education will influence a man considerably, his basic intellectual powers and personality characteristics are inherited or determined in early childhood and will be the major factors determining his ultimate success.

Saugus Iron Works Restored

Restoration of one of the earliest industrial landmarks in America, the first iron works and blast furnace to be operated in the New World, is under way at Saugus, Mass. It is expected to be completed and opened to the public late in 1951, according to the American Iron and Steel Institute.

Roberts Speaks on High Speed Steel

An Unusually Large Number of Springfield Chapter Members Gathered at Greenfield, Mass., in April to Hear George Roberts (Standing), Chief Metallurgist for Vanadium-Alloys Steel Co., Speak on High Speed Steel. Seated, from left, are: Robert Prouty, chief metallurgist of Threadwell Tap and Die Co., technical chairman; W. S. Beecher, chief metallurgist of Indian Motocycle Co., chapter vice-chairman; J. B. Longstaff, coffee speaker; and Prof. R. S. Burpo of University of Massachusetts, chapter secretary. Dr. Roberts' talk has been reported when presented before other chapters. (Reported by Howard E. Boyer, Chief Metallurgist, American Bosch Corp.)

Compliments

To DONALD E. BABCOCK, metallurgical engineer, Republic Steel Corp., on the award of the American Iron and Steel Institute Medal for his paper on "Sulphur Control and Manganese Conservation in Openhearth Furnaces".

♦ ♦ ♦

To D. L. CLARK, superintendent of melting, Simonds Saw and Steel Co., on his election as president of the Electric Metal Makers Guild, Inc.

♦ ♦ ♦

To Prof. B. J. LAZAN of Syracuse University, on the award of the Charles B. Dudley Medal of the American Society for Testing Materials, for his paper on "Dynamic Creep and Creep-Rupture Properties of Temperature-Resistant Materials Under Tensile Fatigue Loading"; also to Prof. D. S. CLARK and D. S. WOOD of California Institute of Technology, on the Richard L. Templin Award of the A.S.T.M. for their paper on "The Time Delay for the Initiation of Plastic Deformation at Rapidly Applied Constant Stress".

♦ ♦ ♦

To DEAN HARVEY, consultant on materials and for many years electrical and materials engineer with Westinghouse Electric Corp.; to ROBERT JOB, retired, formerly vice-president of Milton Hersey Co., Ltd., testing laboratories in Montreal, Canada; and to HENRY S. RAWDON, retired, formerly chief of the division of metallurgy, National Bureau of Standards; on their election to honorary membership in the American Society for Testing Materials.

♦ ♦ ♦

To TRUMAN S. FULLER, engineer in charge of works laboratory, General Electric Co., on his election as vice-president of the American Society for Testing Materials; also to D. K. CRAMPTON, director of research, Chase Brass and Copper Co., Inc., and J. R. TRIMBLE, assistant manager, department of metallurgy, inspection and research, Tennessee Coal, Iron and Railroad Co., on their election to the board of directors of A.S.T.M.

♦ ♦ ♦

To the NORTON CO., Worcester, Mass., on the celebration of the 50th anniversary of its Grinding Machine Division.

♦ ♦ ♦

To TADUEZ SENDZIMIR, vice-president of the Armzen Co. and inventor of the Sendzimir process of continuous galvanizing, on the first annual award by the Galvanizers' Committee of an inscribed bronze plaque in recognition of his fundamental achievements in the art of galvanizing sheets.

Worcester Hears About Heat Treating

ABOVE: Speakers' Table at the April Meeting of the Worcester Chapter A. S. M. Left to right are J. Walter Gulliksen, general superintendent, Worcester Pressed Steel Co., member of the Executive Committee; Carl G. Johnson, associate professor of mechanical engineering, Worcester Polytechnic Institute, technical chairman; Howard E. Boyer, chief metallurgist, American Bosch Corp., who spoke on "Heat Treatment of Steel"; and Orum R. Kerst, sales manager for New York and New England, E. F. Houghton & Co., chapter chairman. BELOW: A group of members entering the meeting (Reported by C. Weston Russell, Wyman-Gordon Co.)

Greatest Progress in Heat Treating Has Occurred In Past 20 Years—Payson

Reported by Edward Rupert
Metallurgist, Allis-Chalmers Mfg. Co.

Although the heating and cooling of steels to obtain desirable properties has been practiced for a long time, it is only in the past 20 years that real progress in improved efficiency of heat treatment has occurred, according to Peter Payson, assistant director of research of the Crucible Steel Co. of America. Mr. Payson presented a talk on the "Fundamentals of Heat Treatment" at the April 18th dinner meeting of the Milwaukee Chapter A.S.M.

Improvements in heat treatment can be attributed partly to the development of better heat treating equipment, but primarily to a much better understanding of the structural changes which occur in steels during the heating and cooling.

Mr. Payson selected three steels—namely, (*a*) a high speed toolsteel, (*b*) a carbon toolsteel, and (*c*) a medium-carbon steel (4340)—to show the influence of composition upon the internal structural changes that occur during heating, and also of the austenite transformation products formed as a function of the cooling rate. Slides were shown comparing the microstructural changes in the three steels at various austenitizing temperatures.

With the aid of T-T-T curves Mr. Payson discussed the austenite transformation on cooling, including the principles of austempering and marquenching. Tempering of low alloy steels is performed between 300 and 500° F. and for high speed steels at 1050° F. A brief question period followed Mr. Payson's talk.

"Baseball In 1950" was the subject of the coffee talk by Mickey Heath.

Research on Metals Coming of Age

Reported by Sigmund Smith
Colorado School of Mines

Research on metals, a backward child of industrial development in the past, is coming of age, William E. Mahin, director of research at Armour Research Foundation of Illinois Institute of Technology, said in addressing the Rocky Mountain Chapter A. S. M. on April 21.

Mr. Mahin showed how research in metallurgy has lagged behind that of chemistry, which grew from the first world war to one of the largest industries in the United States. The chemical industry spends more money for research, has about seven times as many graduates per year as metallurgy, and has produced many more new products since World War I than has the metal industry.

Mr. Mahin then illustrated with slides how the older industries of the world eventually become stagnant, mainly because they do not spend enough money for research to develop new products or improve old products.

The metals industry will have to spend more money for research in the future, Mr. Mahin stated, because our rich ore deposits are becoming depleted and the demand for new alloys is rising at a rapid rate. He expressed the opinion that the metals industry is now rapidly becoming research conscious. Also, more trained metallurgists are being graduated.

Using slides, Mr. Mahin illustrated several of the metallurgical projects at the Armour Research Foundation.

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At the 1949 Metal Show we asked the visitors what they want to see at future Shows. 11,423 want to see materials handling equipment. 400 leading firms will exhibit in Chicago and if you want your share of the business, reserve space now. We have information on 42 other products that Metal Show visitors want. Write, wire or phone UTah 1-0200, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio for more information.

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Two Groups Hear About Canadian Coinage

Legal Tender Ranges From Playing Cards to Gold

Reported by A. R. Deir

Dominion Bureau of Statistics
Department of Trade and Commerce

Ordinary playing cards were once used as money in Canada.

This was only one of the many interesting facts which were brought to light by Robert J. Edmunds, chief of the coin and metal division of the Royal Canadian Mint, at the monthly meeting of the Ottawa Valley Chapter A.S.M. on April 11.

Speaking on "Metals as Money", Mr. Edmunds told how in 1685 the French government of Canada, faced with a serious shortage of currency, decided to use playing cards as a medium of exchange. Signed by the governor, the cards were put into circulation and enjoyed the same confidence as the present dollar bill. This currency continued to be the legal tender of Canada until 1763. It was the first issue of paper money in America.

"That quarter in your pocket is worth only 12 cents if you try to sell the silver it contains," Mr. Edmunds told his audience. A silver dollar is only worth 48 cents.

A government minting coins worth their face value would often face an extreme currency shortage when the price of silver rose on the world market. When this happened, people melted down their coins and sold them in ingot form.

"Men concerned with the minting of coins have exercised their ingenuity all through history against the avarice and dishonesty of certain people," Mr. Edmunds said. "In the early days many made fortunes by scraping off a little share of every gold or silver coin they received." One such "clipper" in the United States offered the government $30,000 for his freedom, when he was caught. By milling the edge of every coin, this practice has been stopped.

He said that silver was fast losing its popularity as the basis for coin money. Many countries are using nickel, and Iran is the only country in the world still minting gold coins.

Mr. Edmunds showed part of the Mint's coin collection to the members. The mint is endeavoring to build up a representative collection of old and new coins of the world. The collection contains some 2,000 pieces, including even the proverbial wooden nickel. The wooden nickel was proposed by Harry Hopkins in 1933, to bolster the jeopardized United States currency.

Mr. Edmunds was introduced by W. R. McClelland, and thanked by H. A. Bleakney. Chairman was Irving C. Sheppard.

Uniformity Stressed in Manufacturing Operations

Reported by W. S. White

Engineering Department
Johnson Wire Works, Ltd.

Canadian "copper" coins are actually bronze, said Robert J. Edmunds, chief, Coin and Metal Division, Canadian Mint, addressing the April meeting of the Montreal Chapter A.S.M. Their nominal composition is 95% Cu, 4% Sn and 1% Zn.

Silver coins are made of 80% Ag and 20% Cu. The 5c coin in Canada is made of pure nickel; in the United States the 5c piece is cupro-nickel. It is probable that cupro-nickel will increase in use for "silver" coins, for over 50 countries are now using nickel or nickel alloy and in Britain the silver coinage has been changed to cupro-nickel. It is approximately one-tenth the cost of the conventional "silver" alloy and is much more durable.

The general procedure for making coins is about the same, although the actual details may vary for the type of coin, or metal, being produced.

The metals are weighed in the Mint office, and are melted in an induction furnace. They are cast into small molds to form coinage bars about 2 ft. long, ½ in. thick, and from 1½ to 2½ in. wide, depending upon the denomination. The molds are kept small since the standard covering homogeneity of the metal is high. Likewise, large molds would entail the use of large rolling equipment, which the production does not justify.

After cooling, the "ingots" are inspected for surface flaws, or other imperfections, and rolled. The reduction per pass is kept small since it is of great importance that the fillets, or strips, be of uniform thickness. The fillets, or strips, are then sent to the cutting department where the coins are cut, 1, 2 or 3, at a stroke, depending on the size of the coin. The machines produce up to 450 blanks per min.

The blanks are then pot annealed in an electric furnace (which the Mint hopes will soon be changed to a high-frequency furnace) and water quenched.

The next step is an acid dip to remove oxide and brighten and condition the coin for final processing, which consists of finishing it in a double action press which forms both faces and the milled edge.

The coins are then visually inspected on both sides, automatically weighed, automatically counted, and packed and check-weighed before storage, ready for issue to the Bank of Canada, or its agents.

The security system covering work in process is very simple. All work is weighed into and out of each department and all of the material must be accounted for by the men who have worked on it. At the end of the day the material is weighed into one of the vaults for storage.

First Philadelphia Chairman G. W. Pressell, Dies at 62

The death of George W. Pressell, 62, vice-president of E. F. Houghton & Co., Philadelphia, occurred suddenly on June 5 at his summer home in Ocean City, N. J. He was a founder member and first chairman of the Philadelphia Chapter of the American Society for Metals.

G. W. Pressell

Mr. Pressell was the oldest Houghton employee in point of service, having started as a messenger boy 47 years ago at $2 a week. He had held offices of chief chemist, secretary, second vice-president, general sales manager and director of sales. Since 1919 he had been a member of the board of directors. He was also President of E. F. Houghton & Co. of Canada, Limited.

During the first World War he contributed much to the heat treatment of steel for munitions. He developed the first treated quenching oil, and held a patent on a sulphurized cutting base, the first concentrate perfected for dilution in the user's plant.

Want a chance AT 9,146 NONFERROUS BUYERS?

Out of the more than 30,000 Metals Engineers—executives and buying officials—nearly one-third of them will be interested in nonferrous metals. For example—9,395 will be interested in Aluminum; 8,221 in Brass and Copper; 4,128 in Lead and Magnesium; 6,085 in Powder Metals and 4,164 in Zinc. If you have anything to sell to the metal industry, be among the 400 leading firms that will display their products at the 1950 Metal Show. Write, wire or phone UTah 1-0200, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

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Powder Metal Industry Looks to New Fields And Better Understanding

Reported by
Stephen A. Minton, Jr.
Allison Division, G.M.C.

The first known use of powder parts manufacture was the fabrication of weapons by Egyptians 3000 years ago, Lee S. Busch, assistant staff metallurgist, P. R. Mallory & Co., told the Indianapolis Chapter A.S.M. at the May 15th annual business meeting and Past Chairmen's Night. The South American Incas also made ornamental objects and bullion from flake powders.

Mr. Busch then went on to cover various aspects of "Powder Metallurgy in Industry".

Metal powders are manufactured by milling, machining, shotting, atomization, condensation of metallic vapors, carbonyl process, reduction of metallic compounds, electrolytic deposition, or chemical precipitation. Pressures for compacting these powders vary from 1 to 50 tons per sq. in., using dies made of hardened tool steel or tungsten carbide in cobalt matrix. Mechanical or hydraulic punch presses are used for compacting. Extrusion of powders with a binder is also possible.

The compacts are sintered at 650° to 3000° C. in neutral atmospheres using furnaces of heat treating or brazing type. With close control, parts so treated can be held dimensionally to $\pm$ 0.003 in. in mass production.

Further operations to increase strength include coining and heat treating. Coining also gives closer dimensional control. Since the compacts are porous, with a tendency to absorb water, corrosion problems may exist. Recent developments in plating of compacts show promise of combatting corrosion.

Powder metallurgy offers two distinct advantages. First, unique materials that cannot be fabricated by any other process are made available by powder metallurgy, and second, manufacturing economies are possible in the production of rather small and simple parts.

The high melting point metals, tungsten, molybdenum, tantalum, and titanium, have reached commercial status through powder metallurgy. Combinations of ceramics and metals are possible. Likewise, the process has provided industry with cemented carbide cutting tools and dies, porous self-lubricating bearings, electrical and magnetic alloys, controlled porosity filters, compressor blades for jet engines, gears, armament parts, keys, locks, belt buckles, electrical contacts, motor and generator brushes, friction materials, and electronic parts.

In the future, the powder metals industry looks forward to many new developments, and its goal is a better understanding of the metallurgical theories of powdered metal parts manufacture.

Explains Work Hardening Characteristics of Al Alloys

Reported by R. E. Samuelson
Beech Aircraft Corp.

"Some Work Hardening and Annealing Characteristics of Aluminum Alloys" were described before the April meeting of the Wichita Chapter A.S.M. by Dana W. Smith, chief metallurgist, Kaiser Aluminum and Chemical Corp., Spokane, Wash.

Dr. Smith dealt chiefly with the alloys designated 2S, 3S, 150S, and 52S. Slides were used to illustrate curves of various annealing temperatures and times after definite amounts of cold work. Photomicrographs and X-ray diffraction patterns substantiated these curves. Dr. Smith likewise presented a clear picture of preferred orientation of crystals in aluminum alloys and its effects on various cold working operations.

A spirited question-and-answer session followed Dr. Smith's talk, in which he answered a great many questions on the new 75S alloy.

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A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio
W. W. Howell, Technical Abstractor
Assisted by Pauline Curry, N. W. Baklanoff, Fred Rothfuss, and Leila M. Virtue

A GENERAL METALLURGICAL

164-A. How To Find Detailed Information When You Want It. A. H. Geisler. *Metal Progress,* v. 57, May 1950, p. 613-617.

Complete classification of the metallurgical field devised by a committee sponsored by ASM and Special Libraries Assoc. Details of improved punched card, especially designed for use with the system. (The code now shown at the end of all abstracts in "A.S.M. Review of Metal Literature" is intended for use in connection with this system.) (A general)

165-A. How Hotpoint Fabricates Dishwasher Baskets From Stainless Steel Wire. Erle F. Ross. *Steel,* v. 126, May 22, 1950, p. 77-79.

Cutting, forming, resistance welding, and electropolishing equipment and procedures. (A5, G general, K3, L13, T10, SS)

166-A. Dental Research. *Technical News Bulletin* (National Bureau of Standards), v. 34, May 1950, p. 64-67.

Review. Includes studies of dental amalgam alloys, gold alloys, silicate cements, denture resins, and of the structure of enamel and dentin. (T10, Au)

167-A. Fire Protection Precautions for Uranium Scrap and Powder. Edward J. Kehoe, Francis L. Brannigan, and Merril Eisenbud. *Nucleonics,* v. 6, May 1950, p. 34-37.

Fire properties of uranium scrap with emphasis on its pyrophoricity. Safe procedures for storage, handling, disposal, and shipment. ICC rules for common-carrier shipment. Effects of various extinguishing agents on burning uranium scrap. (A7, U)

168-A. Conveyors Speed Gas Tank Assembly. W. G. Patton. *Iron Age,* v. 165, May 25, 1950, p. 82-84.

Mechanical handling, welding and soldering equipment and procedures at Oldsmobile's assembly plant. (A5, K3, K7, T21, CN)

169-A. Research From the Standpoint of the Smaller Business Enterprise. G. H. Clamer. *Journal of the Franklin Institute,* v. 249, May 1950, p. 367-391.

Consists largely of six case histories from the author's experiences with Ajax Metal Co. over the past 50 years. (A9)

170-A. Metallurgical Research at Georgia Tech. R. J. Raudebaugh. *Research Engineer* (Georgia Institute of Technology), v. 1, May 1950, p. 3-4, 13-16.

Surveys equipment and outlines some of the projects. (A9)

171-A. Ore To Finished Product; Researches of Dominion Bureau of Mines. W. M. Bonham. *Canadian Mining Journal,* v. 71, May 1950, p. 67-71.

Facilities and research activities. (A9)

172-A. Minerals of the Belgian Congo. *Chemical Age,* v. 62, May 6, 1950, p. 687.

Tables give production data for 1946, 1947, and 1948. (A4)

173-A. Research on Nickel and Its Alloys. *Metal Treatment and Drop Forging,* v. 17, Spring 1950, p. 29-34.

Research in the British nickel industry as carried out at the Birmingham Laboratories of Mond Nickel Co., Ltd. (A9, Ni)

174-A. An Accounting of World Mining for 1949. Charles Will Wright. *Mining World,* v. 12, Apr. 15, 1950, p. 19, 21-24, 26.

An economic survey, (A4, B12)

175-A. Metals and Minerals Review. *Mining World,* v. 12, Apr. 15, 1950, p. 27, 30-32, 35, 37-38, 41, 43, 45.

Economic survey consists of the following brief articles: "Aluminum", Donald M. White; "Antimony", Worthen Bradley; "Arsenic" (anon.); "The Atom", Raw Materials Operations Staff, Atomic Energy Commission; "Bismuth" (anon.); "Cadmium" (anon.); "Copper", Charles H. Winship, Jr.; "Fluorspar", Hugh E. McCray; "Gold", Joseph Stagg Lawrence; "Iron", A. L. Fairley, Jr.; "Lead", Felix E. Wormser; "Magnesium", W. S. Loose; "Molybdenum", C. M. Loeb, Jr.; "Nickel", Robert C. Stanley; "Phosphates", Louis Ware; "Potash", J. W. Turrentine; "Platinum", Charles Englehard; "Silver", Roger O. Oscarson; "Titanium", Joseph H. Reid; "Tin", Robert J. Nekervis; "Tungsten", Worthen Bradley; "Vanadium", Blair Burwell; and "Zinc", E. H. Snyder. (A4)

176-A. Now Radiators! R. J. Reardon. *Western Machinery and Steel World,* v. 41, May 1950, p. 88-89.

Forming, finishing, shearing, joining, and other miscellaneous fabrication procedures in manufacture of radiators for Ford Motor Co. by Modine Mfg. Co., Whittier, Calif. (A5, G general, T21)

177-A. The Current World Zinc Situation. R. L. Wilcox. *Metals,* v. 20, May 1950, p. 8-12.

Includes tabular and graphical data. (A4, Zn)

178-A. Quick Counterattack Urged by Steel Leaders. *Iron Age,* v. 165, June 1, 1950, p. 81-84.

Reviews papers and talks on political, economic, and technological aspects of the iron and steel industry presented at 58th General Meeting of AISI in New York City. (A general, ST)

179-A. How To Dispose of Acid Wastes. J. E. Cooper. *Chemical Industries,* v. 66, May 1950, p. 684-685.

Practical methods. 12 ref. (A8)

180-A. Research and Results at Mellon Institute, 1949-50. *Chemical and Engineering News,* v. 28, May 29, 1950, p. 1810-1815.

A review based upon contents of the 37th annual report of the director. (A9)

181-A. From a Metallurgist's Notebook: Lead Contamination. H. H. Symonds. *Metal Industry,* v. 76, May 19, 1950, p. 405-406.

Some whisky was found to contain a lethal quantity of lead. Tests were carried out on the whisky as received and on the residue found after it had been left standing in a copper flask. It was concluded that the lead was picked up from the solder in the seams and the tin coating of the inside of the flask. (A7, R7, Pb, Cu)

182-A. Recovery of Manganese Slags for the Production of High-Percentage Ferromanganese by Melting Specular Iron. (In German.) Theodor Kootz and Jakob Willems. *Stahl und Eisen,* v. 70, Apr. 27, 1950, p. 360-369.

Most suitable melting conditions and procedures were experimentally investigated, the literature being also reviewed. 13 ref. (A8, B21, Fe-n, Mn)

183-A. Remelting and Refining of Bearing Metal Scrap. (In German.) Th. Meissl. *Chemische Technik,* v. 1, Dec. 1949, p. 182-183. (A8, C21, SG-c)

184-A. Flammable Atmosphere Hazards of Special Atmosphere Furnaces. J. B. Smith. *Industrial Gas,* v. 28, May 1950, p. 7-9, 19-21. (A condensation.)

See abstract of "Safety Procedures for Protection Against Flammable Atmosphere Hazards of Special Atmosphere Furnaces", *Industrial Heating,* items 158-A and 139-J, 1950. (A7, J2)

185-A. Some Aspects of the Mineral

Position of Eight Principal Industrial Nations. E. Willard Miller. *Mineral Industries Experiment Station, Pennsylvania State College,* Technical Paper 165, 1950, p. 133-143. Reprinted from *Economic Geography,* v. 26, No. 2, Apr. 1950.

Covers coal, petroleum, iron ore, pig iron, copper, lead, zinc, bauxite, and aluminum. 17 ref.
(A4, Fe, Cu, Pb, Zn, Al)

186-A. (Book) A History of Steel Casting. Arthur D. Graeff, Editor. 168 pages. 1949. Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15, Ohio. $2.50.

General history, history along the Delaware, individual companies, human interest stories of founders, and some of the leaders in the industry. (A2, CI)

187-A. (Book) The Story of Steel. Max Davies. 96 pages. Burke Publishing Co., London, England.

Written for the layman; mainly historical, but includes modern manufacturing methods. Chapters are devoted to raw materials, openhearth furnace, bessemer converter, electrical and crucible steelmaking, and shaping and treating of steel.
(A2, D general, ST)

B

RAW MATERIALS AND ORE PREPARATION

181-B. Research Studies in Mineral Engineering Using Radionuclides. A. M. Gaudin and P. L. de Bruyn. *Scientific Monthly,* v. 70, June 1950, p. 365-375.

Application of radionuclides to mineral dressing, and particularly to the detailed mechanism of the flotation process of mineral separation. Some typical problems to which this tool is being applied at MIT under the sponsorship of Armour and Co. and the U. S. Atomic Energy Commission. 47 ref. (B14, S19)

182-B. Preparation and Properties of Refractory Cerium Sulfides. E. D. Eastman, Leo Brewer, LeRoy A. Bromley, Paul W. Gilles, and Norman L. Lofgren. *Journal of the American Chemical Society,* v. 72, May 1950, p. 2248-2250.

Methods of preparation, apparatus used, and physical, chemical and thermodynamic properties of the cerium sulfides. Their stability and low reactivity should make them useful as refractories for many applications, especially where it is desirable to prevent oxygen contamination and when dealing with strongly electropositive metals. 13 ref. (B19)

183-B. The Importance of Automatic Sampling: Potentialities and Applications. J. Visman. *Fuel,* v. 29, May 1950, p. 101-105.

Sampling of mineral raw materials used for industrial purposes. Sampling methods for fine and coarse-grained mixtures of particles in which the content of one particular constituent has to be determined with a certain accuracy. Automatic pipe sampler and method for checking calculated accuracy. (B11)

184-B. Refining Zinc-Gold Precipitate at Consolidated Beattie Mines. J. E. Finlay. *Canadian Mining Journal,* v. 71, May 1950, p. 59-66.

Fluxing of cyanide-zinc-gold precipitates. Fundamental concepts pertaining to the fluxing of this type of precipitate and an example of flux calculations for a specific precipitate. Details of refining procedure at the above plant. (B14, Au, Zn)

185-B. Extraction of Copper in Africa. F. D. L. Noakes. *Metal Treatment and Drop Forging,* v. 17, Spring 1950, p. 35-41, 52.

Mining, milling, beneficiation, and smelting procedures. Copper metallurgy in the Belgian Congo. (B12, B13, B14, C21, Cu)

186-B. Viscosity and Fusibility of Slags. (In French.) Paul Kozakevitch. *Revue de Métallurgie,* v. 47, Mar. 1950, p. 201-209; discussion, p. 209-210.

Factors involved and their influence on the smelting process. Experimental data are analyzed and interpreted. 17 ref. (B21)

187-B. Possibilities and Advantages of the Use of Gyratory Crushers in Ore Dressing. (In German.) Edgar Puffe. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 3, Feb. 1950, p. 41-47; Mar. 1950, p. 75-77.

Critical analysis, including diagrams, tables, and graphs. Advantages of gyratory crushers over other types. (B13)

188-B. The Zinc Sulfide Filtering Process. (In German.) Artur Kutzelnigg. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 3, Mar. 1950, p. 77-82.

Proposed process for separating Au, Os, Ru, Pd, Hg, Ag, Bi, Cu, Fe, As, U, Pt, Rh, and Ir from their salt solutions by filtering them through highly annealed granular ZnS. The process is practically applicable only to the precious and rarer metals. (B14, Ag, EG--a,c,h)

189-B. Mechanism and Rate of the "Collection" Process in Connection With Promotion of the Flotation Process. (In Russian.) V. A. Glembotskii. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Feb. 1950, p. 253-258.

Mechanism of interaction of molecules of collector with mineral surfaces was investigated, taking into consideration non-uniformities of their surfaces, nature of sorption forces, and possible interactions of the collector molecules. (B14)

190-B. Determination of Grain-Size Distribution of Minerals During Investigation of Influence of Composition and Structure of Ores on Their Ability to be Concentrated. (In Russian.) I. N. Plaksin and S. K. Shabarin. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Feb. 1950, p. 259-263.

New graphic method for determining size distribution of disperse minerals. Such characterization may be used for evaluation of ability of ores to be concentrated. (gold ores used as an example). 21 ref.
(B14, Au)

191-B. Metallurgical Oxygen Speeds Foundry Open Hearth Melting. L. L. Whitney. *American Foundryman,* v. 17, May 1950, p. 57-59.

Experiences of American Steel Foundries, Alliance, Ohio.
(B22, D2, ST)

192-B. Sintering Adirondack Magnetites. W. R. Webb and R. G. Fleck. *Mining Engineering,* v. 187, June 1950, p. 671-672.

Equipment and procedures.
(B16, Fe)

193-B. Deposits of Heavy Minerals on the Brazilian Coast. Joseph L. Gillson. *Mining Engineering,* v. 187, June 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 187, 1950, p. 685-693.

Description includes maps and tabular data. Recoverable products are ilmenite, zircon, and monazite (rare-earth oxides, ThO_2, and CeO_2.) 15 ref. (B10, Ti, Zr, EG-g)

194-B. Progress Report on Grinding at Tennessee Copper Company. J. F. Myers and F. M. Lewis. *Mining Engineering,* v. 187, June 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 187, 1950, p. 707-711; discussion, p. 711.

Development of a large, slow-speed ball mill closed circuited with a hydroscillator. Grinding efficiency is 28% higher than conventional units. (B13)

195-B. Some Problems in the Sampling of Bulk Materials. Louis Tanner and W. Edwards Deming. *American Society for Testing Materials, Proceedings,* v. 49, 1949, p. 1181-1186; discussion, p. 1187-1188.

Previously abstracted from *American Society for Testing Materials,* Preprint No. 80. See item 12-141, 1949. (B11)

196-B. Iron Ore in Brazil. (In Portuguese.) Octavio Barbosa. *Mineracao e Metalurgia,* v. 14, Nov.-Dec. 1949, p. 100-101.

Briefly reviews existing iron-ore deposits, indicating locations, types of ore, and proved tonnages.
(B10, Fe)

197-B. Cyclone Separator May Be Solution for Fine Iron Ore Problem. Stephen E. Erickson and Earl C. Herkenhoff. *Engineering and Mining Journal,* v. 151, June 1950, p. 71-73.

Process for handling irons of size fractions from 3/16 in. down to 65 mesh, using the Dutch State Mines cyclone separator. Includes flowsheet and tabulated results.
(B13, Fe)

198-B. Adirondack Iron Ore Field Still Offers Many Challenges. Donald B. Gillies. *Engineering and Mining Journal,* v. 151, June 1950, p. 84-87.

Includes discussion of ore preparation. (B10, B14, Fe)

199-B. Pacific Isle's North Uno Mill Upgrades Varied Iron Ores. *Mining World,* v. 12, June 1950, p. 12-15.

Iron ore preparation at Pacific Isle Mining Co.'s North Uno mill, Hibbing, Minn. (B14, Fe)

200-B. Philipsburg Manganese. *Mining World,* v. 12, June 1950, p. 16-19.

Taylor-Knapp Co. produces the only battery grade Mn in the U. S. Ore dressing procedure; includes flowsheet. (B13, B14, Mn)

201-B. Sigman, A Canadian Gold Mine. A. G. G. Oliver. *Mine & Quarry Engineering,* v. 16, June 1950, p. 183-188.

Includes mill flowsheet.
(B12, B13, Au)

202-B. Flowsheet for Tungsten Ore. *Deco Trefoil,* v. 14, May-June 1950, p. 15-16.

Process which recovers a high-grade concentrate from an initial coarse, unclassified feed, with a minimum amount of slimes. (B14, W)

203-B. Basic Refractories; Their Chemistry in Relation to Their Performance. (Continued.) J. R. Rait. *Iron and Steel,* v. 23, May 11, 1950, p. 183-189.

Deals with the system CaO-MgO-SiO_2-Al_2O_3-Fe_2O_3. (To be continued.)
(B19)

National Metal Congress and Exposition
Chicago—Oct. 23-27, 1950

C

NONFERROUS EXTRACTION AND REFINING

64-C. Melting and Casting of Nonferrous Metals. *Metal Progress,* v. 57, May 1950, p. 650, 652, 654, 656, 658, 660, 662, 670, 672.

Condensed from "Symposium on Metallurgical Aspects of Nonferrous Metal Melting and Casting of Ingots for Working" (6 papers). First published in *Journal of the Institute of Metals,* v. 75, Jan. 1949 (papers separately abstracted); republished with discussion in *Institute of Metals,* Monograph and Report Series No. 6. See item 58-C, 1950. (C21, C5, EG-a, Cu)

65-C. Lead-Removal and Slagging of Oker's Oxide Ores in the Revolving Furnace. (In German.) Otto-Hermann Schutze. *Zeitschrift für Erzbergau und Metallhüttenwesen,* v. 3, Mar. 1950, p. 69-74.

Method used in the Herzog-Juliushütte for mining and smelting zinc oxide ores. Final products are a low-Pb concentrate and a Pb dust in utilizable form. (C21, Zn, Pb)

66-C. Continuous Casting of Non-Ferrous Metals. (In Polish.) M. Schneider and E. Zalesinski. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa,* v. 2, no. 1, 1950, p. 49-70.

The Junghans, V. L. W., and Asarco process, their advantages and disadvantages. The possibilities of applying continuous casting methods to steel are considered with reference to the paper of H. Kästner *(Stahl und Eisen,* v. 66, 1947). Theoretical calculations of ingot solidifications are made according to formulas given by Roth. Effects of continuous casting on microstructure and on mechanical properties. 10 ref. (C5)

67-C. Design and Control of Ferro-Alloy Furnaces. F. V. Andreae. *Electrical Engineering,* v. 69, June 1950, p. 531. (A condensation; To be published in full in *AIEE Transactions,* v. 69, 1950.)

Ferro-alloy furnaces form a special group of electric furnaces in which the electrodes are buried in the charge instead of standing over a bath of molten metal as in steel-melting furnaces. They are used for the manufacture of various alloys such as ferrosilicon, ferrochrome, ferromanganese, silicomanganese, calcium silicide, and calcium carbide. Includes schematic diagram. (C21, Fe)

68-C. Energy Consumption in the Production of Ferrosilicon in the Triple-Phase Low-Stack Furnace. (In German.) Georg Volkert and Erich Schwarz. *Stahl und Eisen,* v. 70, Apr. 27, 1950, p. 369-371.

Results of a comparative study on the effect of different melting conditions. (C21, Fe-n, Si)

69-C. A Survey of the Thermodynamics of Copper Smelting. R. Schuhmann, Jr. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, June 1950, p. 873-884.

Available thermodynamic data are collected and tabulated, pointing out important gaps. An experimental research program is proposed to supply data that appear most essential to better quantitative understanding of the chemistry involved, and is designed specifically for practical problems of slag losses and magnetite behavior. 16 ref. (C21, P12, Cu)

70-C. Brass Bars for Strip and Sheet Continuously Cast in New Plant. *Inco,* v. 24, Spring, 1950, p. 4-8.

Production line at Scovill Manufacturing Co. starts with casting and ends with packaging of sheet and strip. (C5q, Cu)

71-C. Refining of Tin. E. H. Jones. *Mining Journal* (London), v. 234, May 19, 1950, p. 514-517.

Flotation, calcination, acid leaching, smelting, liquation, electrolysis, distillation, and specialized processes. (C general, B14, Sn)

72-C. A Laboratory Study of the Influence of Ferricyanide on the Extraction of Gold. G. L. Putnam. *Journal of the Chemical Metallurgical & Mining Society of South Africa,* v. 50, Mar. 1950, p. 228-231.

Investigation to find an economical method for converting ferrocyanides to ferricyanides in the presence of sodium cyanide, and to stabilize the resulting solutions. The reactions of the Adair-Usher modification of the cyanide process. (C24, Au)

D

FERROUS REDUCTION AND REFINING

162-D. Alternative Iron Smelting Processes. P. E. Cavanagh. *Metal Progress,* v. 57, May 1950, p. 631-636.

Based on a study by Ontario Research Foundation of some 150 processes for producing iron from ores. Detailed studies were confined to commercially proven processes. Large and small blast furnaces, electric smelting, and the sponge-iron process. Cost analyses based on Canadian conditions in 1948. Map of Canada shows locations where alternative processes have best chance of success. (D1, D8, Fe)

163-D. Steel Development Builds Industrial Basis. R. M. Dyke. *Western Miner,* v. 23, May 1950, p. 40-42.

Production of electric-furnace steel from scrap in British Columbia. Also includes rolling and forming operations. (D5, F22, ST)

164-D. First Report of the Ingot Surface Defects Sub-Committee. *Journal of the Iron and Steel Institute,* v. 165, May 1950, p. 41-66.

Occurrence of the principal types of ingot surface defect—cracks, blow-holes, and shelliness—in the three main classes of steel-killed, balanced and effervescing. Part I: The causes and control methods for various defects. Part II: Plant-scale experiments and definite recommendations based on the results. 14 ref. (D9, ST)

165-D. Thermodynamic Aspects of the Movement of Sulphur Between Gas and Slag in the Basic Open-Hearth Process. F. D. Richardson and G. Withers. *Journal of the Iron and Steel Institute,* v. 165, May 1950, p. 66-71.

A theoretical study was made of the sulfur equilibrium between a basic slag containing sulfur and the furnace gases in the openhearth process. Concludes that the higher the slag temperature, and the more complete the degree of combustion of the gases coming into contact with the slag surface, the less chance there is of the slag picking up sulfur from the gas phase. Combustion limits required at the slag surface in the presence of gases of various sulfur contents, to avoid pick-up in the refining period, are calculated. 11 ref. (D2, B21, ST)

166-D. Studies in the Deoxidation of Iron; Deoxidation by Aluminum. H. A. Sloman and E. L. Evans. *Journal of the Iron and Steel Institute,* v. 165, May 1950, p. 81-90.

The preparation, microscopical examination, and analysis of a series of 19 ingots made by adding quantities of iron oxide and Al to 300-500 g. melts of pure iron, in vacuo. Results reported include total O_2 contents obtained by the vacuum-fusion method, Al contents, and chemical and X-ray analyses of the non-metallic residues of alcoholic-iodine extraction. The inclusions consist mainly of α-alumina when Al is in stoichiometric excess of the O_2. An equilibrium constant of the deoxidation reaction is derived in an appendix by O. Kubaschewski. 26 ref. (D general, Fe)

167-D. The Freezing of Continuously Cast Steel. *Metal Treatment and Drop Forging,* v. 17, Spring 1950, p. 3-10. Translated and condensed from paper by H. Krainer and B. Tarmann, *Stahl und Eisen,* v. 69, Nov. 10, 1949, p. 813-819.

Previously abstracted from *Stahl und Eisen.* See item 13-D, 1950. (D9, ST)

168-D. Study of Blast-Furnace Charging Using Calcareous Minerals of Different Lump-Size Ranges. (In French.) Joseph Leflaive and Jean Lemonnier. *Revue de Métallurgie,* v. 47, Mar. 1950, p. 158-166.

Influence of size distribution of charge on efficiency and economy of blast-furnace operation. (D1, Fe)

169-D. Progress Achieved in Openhearth Steel Production by Use of Chrome-Magnesia Refractories. (In French.) Henry Barret. *Revue de Métallurgie,* v. 47, Mar. 1950, p. 211-214; discussion, p. 214.

The possibility of replacement of standard silica bricks by chrome-magnesia in openhearth furnace construction. Results indicate an increase in productivity and decrease in unit cost. (D2, ST)

170-D. Contribution to Metallurgy of the Blast Furnace. (In German.) Theo Kootz and Willy Oelsen. *Archiv für das Eisenhüttenwesen,* v. 21, Mar.-Apr. 1950, p. 77-88.

Reviews the literature and discusses the principles applying to the composition of pig iron and slag, silicon as a reducing agent, sequence of reduction in the furnace, and effects of charge composition and temperature on the reduction process. 42 ref. (D1, Fe)

171-D. Consumption of Electrodes in the Electric Steelmaking Furnace. (In German.) W. E. Schwabe. *Elektrowärme Technik,* v. 1, Mar. 1950, p. 6-8.

Causes of rapid electrode consumption in the range 600-1300° C. were studied. Recommendations for means of reducing it. (D5, ST)

172-D. Oxygen in the Converter Process. (In Polish.) A. Ludkiewicz and J. Natkaniec. *Prace Badawcze Glownego Instytutu Metallurgii i Odlewnictwa,* v. 2, no. 1, 1950, p. 71-79.

Results of theoretical analysis

and of production-scale tests showing advantages of oxygen addition. 13 ref. (D2, B22, ST)

173-D. Design, Construction and Use of Steel Mill Checker Brick. *Industrial Heating,* v. 17, May 1950, p. 874, 876. Based on paper by Jay J. Seaver.

See abstract under similar title from *Iron and Steel Engineer,* item 72-D, 1950. (D2)

174-D. New Process Eases Pigment Manufacture. *Chemical Industries,* v. 66, May 1950, p. 681, 792.

Titanium slag concentrate obtained by smelting Fe-Ti ores is said to be superior for processing to titanium pigments. Iron is recovered as marketable pig iron. Description is based on U. S. Patent 2,476,453, issued to Quebec Iron and Titanium Corp. (D1, C21, T29, Fe, Ti)

175-D. Iron and Steel Making. I. The Blast Furnace—Thermodynamic Background. F. D. Richardson and J. H. E. Jeffes. *Iron and Steel,* v. 23, May 11, 1950, p. 230-238; discussion, p. 268-270.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 4-D, 1950. (D1, P12, ST, Fe)

176-D. Blast-Furnace Operation; Influence of Gas/Solid Temperature Differences. J. Taylor. *Iron and Steel,* v. 23, May 11, 1950, p. 239-243; discussion, p. 268-270.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 53-D, 1950. (D1, Fe)

177-D. B.-F. Gas Cleaning; An Analysis of Plant Performance in Great Britain. R. F. Jennings. *Iron and Steel,* v. 23, May 11, 1950, p. 243-251; discussion, p. 270-272.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 90-D, 1950. (D1, Fe)

178-D. Particles in B.-F. Gas; Use of Curves and Nomograms for Calculating Their Motions. J. Stringer. *Iron and Steel,* v. 23, May 11, 1950, p. 251-254; discussion, p. 270-272.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 89-D, 1950. (D1, ST)

179-D. Burden Distribution; A Modified B.F. Top To Give Controlled Distribution. E. L. Diamond. *Iron and Steel,* v. 23, May 11, 1950, p. 254-258; discussion, p. 272-275.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 54-D, 1950. (D1, Fe)

180-D. Dependence of Coke Consumption on Temperature of the Blast in the Blast Furnace. (In German). Ernst Krebs. *Stahl und Eisen,* v. 70, Apr. 27, 1950, p. 358-360.

Shows that the blast temperature affects, in addition to coke consumption, other smelting conditions which, in turn, affect coke consumption and that it is therefore impossible to compute the effect of blast-temperature change on the coke consumption. (D1, Fe)

181-D. Nitrogen in Basic Steel. (In German.) Werner Gilde. *Chemische Technik,* v. 1, Dec. 1949, p. 183-185.

Methods of counteracting the effects of nitrogen (or of preventing its absorption) by adding Al and Si to the molten steel, by suitable melting practice, and by keeping the P content as low as possible. Includes graphs and tables. (D2, ST, N)

182-D. Oxygen Jets Through the Open Hearth Backwall. A. E. Reinhard. *Journal of Metals,* v. 188, June 1950, p. 835-837.

(D2, B22, ST)

183-D. Oxygen in Liquid Open-Hearth Steel—Oxidation During Tapping and Ladle Filling. T. E. Brower, J. W. Bain, and B. M. Larsen. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, June 1950, p. 851-861.

A mass of circumstantial evidence indicates that the main source of alloy losses in openhearth tapping is oxidation by air, with the steel apparently reacting with an amount of oxygen equivalent to about 30 times its own volume of air. The effect is erratic from heat to heat, depending largely on turbulence and distance of free fall of the stream of liquid metal. (D2, D9, ST)

184-D. Thermal Segregation: A Mechanism for the Segregation of Hydrogen in Steel. G. Derge and E. E. Duncan. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, June 1950, p. 884-885.

Results indicate that "thermal segregation" has much more influence on the control of hydrogen in steel than most other processing factors, such as furnace practice. (D, ST)

185-D. Magnesium Alloys Aid Desulfurization. S. L. Gertsman and B. F. Richardson. *Iron Age,* v. 165, June 15, 1950, p. 104-107.

Experiments with induction heats using two methods of introducing a 50% Al, 50% Mg alloy which indicate that sulfur in steel can be consistently reduced to 0.010-0.015%. Initial sulfur content is not important. Improves ductility. (D6, ST, Mg)

186-D. Session on Basic Open Hearth Quality and Metallurgy at Silver Anniversary Open Hearth Conference. B. B. Rosenbaum. *Industrial Heating,* v. 17, May 1950, p. 832, 834, 836, 838, 840.

Summarizes proceedings of conference. Effect of Al on steel quality; hydrogen in steel; and vanadium as a deoxidizer. (To be continued.) (D2, ST)

187-D. Special Ladle Technique Eliminates 90% of Sulphur in Iron. E. P. Best. *Steel,* v. 126, June 19, 1950, p. 108, 110, 112.

See abstract of "Desulfurizing for the Bessemer Process", *Blast Furnace and Steel Plant,* item 63-D, 1950. (D3, D8, Fe)

E

FOUNDRY

244-E. Announcing—New "Croning Process". *Bakelite Review,* v. 22, Apr. 1950, p. 22-23.

New foundry process which employs bakelite resin binders for producing cores and molds from sand. (E18)

245-E. Solidification and Structure of Cast Irons. (In French.) Armand Descy. *Fonderie,* Mar. 1950, p. 1973-1981.

Exchange paper from Belgian Foundry Assn. attempts to show that certain facts appearing exceptional and abnormal in reality should be considered as normal. Such an approach is said to result in improved interpretation of existing solidification diagrams for Fe-C-Si and Si-C in cast iron. (E25, CI)

246-E. Special Features of Molds for Gravity Casting of Aluminum Alloys. (In French.) Pierre Fouron and René Bourret. *Fonderie,* Mar. 1950, p. 1982-1986.

Factors involved in gravity casting process were investigated. Proposes five basic rules to obtain favorable results. (E11, Al)

247-E. Fabrication of Electric-Motor Rotors by Casting in Aluminum. (In French.) Gustave Caminade. *Fonderie,* Mar. 1950, p. 1992-1993.

Various methods of casting, particularly permanent mold casting; choice of alloy; and foundry equipment. (E12, Al)

248-E. Gas-Heated Melting Furnaces for Light-Metals. (In German.) Hermann Repky. *Gas und Wasserfach,* v. 91, Apr. 15, 1950, p. 89-92.

Efficiency of several crucible furnaces for light-metal melting investigated from an economic point of view. (E10, Al, Mg)

249-E. The Melting and Casting of Light Metals. (In German.) Kurt Schneider. *Neue Giesserei,* v. 37 (new ser., v. 3), Apr. 20, 1950, p. 145-148.

An illustrated, descriptive review. (E general, Al, Mg)

250-E. Artistic Foundry Practice. (In Czech.) Mojmir Cenek. *Hutnické Listy,* v. 5, Feb. 1950, p. 61-66.

The bronze casting of an artistic statue in an experimental foundry. (E11, T9, Cu)

251-E. Foundry Practice and Electrotechnique. (In Dutch.) E. M. H. Lips. *Metalen,* v. 4, Apr. 1950, p. 157-165.

Various uses of electricity in foundry practice, the testing of metals, and the uses of cast metals for electrical equipment. Electrical and magnetic properties of various metals and alloys. (T1, P15, E general)

252-E. Clay as Binder for Foundry Sand. (In Dutch.) M. Stap. *Centraal Instituut voor Materiaal Onderzoek Afdeling Metalen,* Apr. 1950, p. 2-7.

Previously abstracted from *Metalen.* See item 14A-178, 1949. (E18)

253-E. Melting and Casting of Nonferrous Metals. (In Dutch.) M. Stap. *Centraal Instituut voor Materiaal Onderzoek Afdeling Metalen,* Apr. 1950, p. 16-20.

Previously abstracted from *Metalen.* See item 127-E, 1950. (E general, EG-a)

254-E. Production of Malleable Castings. Parts I & II. James H. Lansing. *Steel,* v. 126, May 22, 1950, p. 86, 88, 91-92, 94, 97; June 5, 1950, p. 106, 108, 110, 115-116, 118.

Brief history. Equipment, procedures, and products. (E11, CI)

255-E. Modern Foundry Methods. *American Foundryman,* v. 17, May 1950, p. 74.

Equipment for dewatering core sand and electrical control for cupola mixing ladle. (E18, E10)

256-E. Further Results of Belgian Nodular Cast Iron Research. Albert De Sy. *American Foundryman,* v. 17, May 1950, p. 75-83.

Treatment with Mg was chosen for thorough investigation by the Belgian investigators. Effects of various compositions and of their factors were studied. Effects of Mg-rich alloys containing Ni, Si, and C. (E25, CI)

257-E. Malleable Iron Annealability; Excess Oxidation Effect in Cupola Melting. Milton Tilley. *American Foundryman,* v. 17, May 1950, p. 88-89.

Previously abstracted from "Effect of Oxidation in Cupola Melting on Annealability of Malleable Iron." *Foundry.* See item 158-E, 1950. (E25, J23, CI)

258-E. Redesign Steel Castings to Achieve Lower Production Costs, Im-

proved Castability, Better Appearance, Reduced Weight. *Steel,* v. 126, June 5, 1950, p. 92-94.

Turbine casting from alloy steel. Redesign of trailer-hitch, idler gear rocker, and other parts. (E general, T25, CI)

259-E. Long Wearing Castings. *Steel,* v. 126, June 5, 1950, p. 104.

Iron castings produced by new centrifugal casting technique; they are gray-cast, require no annealing, and the castings are hard. (E14, CI)

260-E. How To Specify Diecasting Dimensions. W. W. Broughton. *Iron Age,* v. 165, June 8, 1950, p. 79-82.

Steps involved and limitations encountered. With proper dimensioning, error can be avoided and parts can be produced to high accuracy, strength, and surface finish; scrap can be reduced and metal economy achieved. (E13)

261-E. New Cupola Design Incorporates Water Cooling, Basic Lining. *Foundry,* v. 78, June 1950, p. 82-85, 193, 196, 199.

Work of Ford Motor Co. Ltd., in England, in reducing cupola-lining wear through adoption of water cooling for the melting zone; also in obtaining increased desulfurization by use of a basic lining. (E10, CI)

262-E. Casting Defects Caused by Core Gases. H. L. Campbell. *Foundry,* v. 78, June 1950, p. 86-87, 210, 212-213.

Recommendations for prevention by careful attention to the various factors involved. (E25)

263-E. Growth of an Idea. William G. Gude. *Foundry,* v. 78, June 1950, p. 88-93.

Equipment and procedures of gray-iron foundry of New Idea Division, Avco Mfg. Co. (E11, CI)

264-E. Refractories in the Foundry. W. F. Ford and J. R. Rait. *Foundry Trade Journal,* v. 88, May 11, 1950, p. 497-501; discussion, p. 501-502.

Deals particularly with silica-clay mixtures. Chemical and grading compositions, constitutions, installation, and control of the properties of seven proprietary mixtures intended for lining cupolas, converters, rotary furnaces, ladles, etc. (E10)

265-E. Casting of Large Gear Wheels. W. H. Hopkins, J. H. West, and H. G. Goyns. *Foundry Trade Journal,* v. 88, May 11, 1950, p. 503-508.

The way in which the authors would mold and cast large gear wheels in cast iron, bronze, and steel respectively. (E11, T7, CI, Cu)

266-E. Venting Arrangements and Ejector Mechanisms. H. K. and L. C. Barton. *Machinery* (London), v. 76, May 25, 1950, p. 752-759.

For die-casting equipment. (E13)

267-E. Iron-Carbon Alloys and Cast Irons; Influence of Low Percentages of Certain Elements on the Microstructure. W. J. Williams. *Iron and Steel,* v. 23, May 11, 1950, p. 220-230; discussion, p. 266-267.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 209-E, 1950. (E25, M27, CN, CI)

268-E. Fettling. *B.S.F.A. Bulletin,* v. 2, Feb. 1950, p. 1-7.

Procedures and equipment for cleaning and trimming castings to the final unmachined contours and condition desired. (E24)

269-E. Ring-Shaped Sections of Automobile Pistons Produced by Centrifugal Casting. (In Polish.) P. Januszewicz. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa,* v. 1, No. 3, 1949, p. 195-201.

Difficulties of obtaining suitable structures, especially difficulties concerning shape and suitable dimensions of the graphite. Experimental study confirmed the special applicability of centrifugal casting in chills insulated with a coating of casting sand 10 mm. thick, giving a dispersed lamellar graphite. (E14, T21, CI)

270-E. Gating and Risering Tin Bronze Castings. (Continued.) Clyde L. Frear. *Foundry,* v. 78, June 1950, p. 94-95, 213-214, 216, 218.

Influence of gate location and tapered sections on internal soundness of the cast metal. (To be continued.) (E22, Cu)

271-E. Steel Foundry Core and Molding Sands. John Howe Hall. *Foundry,* v. 78, June 1950, p. 100-101, 232-243.

Concludes discussion of metal penetration into molds and cores, and takes up types of sands and binders. Physical properties and applications of such binders as clay, cereal, pitch, lignin, gilsonite, resins, and core oil. (To be continued.) (E18, CI)

272-E. Flow Calculations for Die Casting Applied to the A.S.T.M. Committee B-6 Test Casting Die. Edward Jacobi. *ASTM Bulletin,* May 1950, p. 65-69.

The equation of steady flow in filling a die-casting die is derived and solved for a range of pressures, velocities, and gate orifices. Relation to optimum die-casting die design and operation. (E13)

273-E. Making Torque Converter Parts by Plaster Casting Process. Joseph Geschelin. *Automotive Industries,* v. 102, June 1, 1950, p. 50-51, 76.

Process for producing cast aluminum torque converter parts for Packard's Ultramatic drive includes the use of cores combining dry sand structures with an assembly of plaster core pieces. Cope and drag are machine molded with green sand, in more or less conventional fashion, using metal patterns. (E16, T21, Al)

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274-E. Die Cast Base Increases Versatility. *Die Castings,* v. 8, June 1950, p. 24-26.

Die casting and assembling parts for child's aluminum training chair. (E13, Al)

275-E. Plated Die Cast Tubes Solve Special Problems. *Die Castings,* v. 8, June 1950, p. 29-30, 68-70.

Die casting from Zn and chromium plating of tubes for coin changers. (E13, L17, Zn, Cr)

276-E. The Perfect Set-Up. *Die Castings,* v. 8, June 1950, p. 32-33, 70-71.

Die-cast aluminum spotting collars used in electric semi-automatic pinsetter for bowling pins. Reinforcement against impact and design. (E13, T10, Al)

277-E. Die Cast Vs. Stamped Stove Trim. *Die Castings,* v. 8, June 1950, p. 34-35.

Procedure used at Grand Home Appliance Div. for manufacture of gas range. (E13, T10, Al, Zn)

278-E. Five Product Design Case Histories. David H. Thorburn. *Die Castings,* v. 8, June 1950, p. 36-41.

Die castings used in self-operating temperature regulator include the aluminum shell, aluminum radiator valve cover, zinc thermometer plates, water mixer handles, and a spiral mounting sector. (E13, T8, Al, Zn)

279-E. Permanent-Mold Casting of Copper-Base Alloys. G. K. Eggleston and S. E. Gregory. *Machinery* (American), v. 56, June 1950, p. 155-160.

Procedures. Data on composition and physical and mechanical properties of various alloys are tabulated and discussed. (E12, P general, Q general, Cu)

280-E. We See How Investment Castings Are Made at the International Nickel Co. *Plant,* v. 1, June 1950, p. 46-47.

Picture story of the lost wax method. (E15, Ni)

281-E. Impregnation of Porous Castings With Silicate of Soda. *Ceramic Age,* v. 55, May 1950, p. 332.

After treatment by method outlined, parts are dried and brushed to eliminate the final traces of silicate adhering to walls and metal, and can be machined and handled in the usual manner. (E25)

282-E. Cast-in Tungsten Carbide Inserts. *Machinery* (London), v. 76, May 18, 1950, p. 708.

Procedure in which the tungsten carbide insert is treated in such a way that it becomes completely united or "brazed" to the parent metal. (E general, W, C)

283-E. Non-Ferrous Foundry Practice. J. Bamford. *Foundry Trade Journal,* v. 88, May 18, 1950, p. 525-532; discussion, p. 532-533.

A general discussion, reviewing manufacturing differences between ferrous and nonferrous technique. (E general, EG-a)

284-E. Modernizing an Iron Foundry. L. W. Bolton and W. D. Ford. *Foundry Trade Journal,* v. 88, May 25, 1950. p. 551-558.

Factors influencing choice of molding sand and metal mixture and successful production of cores over a wide range of sizes with a standard time-temperature drying cycle. Use of automatic shakeouts and ways of securing fume and dust-free working at shakeout stations. Experience with lighting, heating, and use of color. (E18, E24, CI)

285-E. Steel Castings Replace Fabrications; Components of a 28-Ton

Rotor Reduced to Two. *Foundry Trade Journal,* v. 88, May 25, 1950, p. 567.

Production of rotor for service in a water-driven turbo-alternator. (E11, T25, CI)

286-E. (Book) Fundamentals in the Production and Design of Castings. Clarence T. Marek. 384 pages. John Wiley & Son, 440 4th Ave., New York 16, N. Y. $4.00.

Stresses the importance of correlating casting design with the economical manufacture of castings. Techniques, skills, and practices of casting production. Jobbing-shop molding, theory of clay bond, patterns and cores, and new methods of high-voltage X-ray and supersonic inspection. Properties and uses of ferrous and nonferrous metals and the melting of cast metals. (E general)

F

PRIMARY MECHANICAL WORKING

127-F. Die Sinking for Drop Forging. Part VIII. Corner Radii, Fillets and Draft Angles. John Mueller. *Steel Processing,* v. 36, May 1950, p. 234-237.

Diagrams and tables show design principles. (To be continued.) (F22, ST)

128-F. Controlled Heating for Rolling. W. H. Dailey, Jr. *Iron and Steel Engineer,* v. 27, May 1950, p. 108-110.

Advantages and variations applicable to high and low-speed heating. (F23)

129-F. New Aluminum Extrusion Process May Simplify Aircraft Construction. *Steel,* v. 126, May 29, 1950, p. 63.

Improved mass-production methods and considerable savings in manufacturing and materials costs are seen in method for producing skin and skin-stiffening elements as one unit. (F24, T24, Al)

130-F. Extruded Aluminum Sheet With "Built-In" Reinforcement. *Modern Metals,* v. 6, May 1950, p. 30.

Reynolds' new process for extruding integrally stiffened aircraft skin. (F24, T24, Al)

131-F. Application of Logarithmic Strain Ratios to Tube Drawing. Jean Tranier. *Metal Treatment and Drop Forging,* v. 17, Spring 1950, p. 11-12; discussion, p. 13-14.

Method for application of logarithmic strain ratios to the cold drawing of duralumin tubes. Includes commentary by E. Voce, who suggests a modified version of the chart. (F26, Al)

132-F. Steel Sheet and Strip Manufacture. J. Lomas. *Machinery Lloyd.* (Overseas Edition), v. 22, Apr. 29, 1950, p. 91-93, 95, 97.

Preparation of the slabs for rolling. Various problems in hot and cold rolling of steel. Various types of rolling mills for the different operations. Heat treatment of the rolled materials. (F23, ST)

133-F. Large Forgings. (In Czech.) Jiri Novak. *Hutnické Listy,* v. 5, Jan. 1950, p. 10-17.

Various problems encountered in production of large steel forgings. Includes testing and inspection methods. (F22, ST)

134-F. Improving the Production of Crankshafts for Large Piston Engines. (In German.) Friedrich Wilhelm Nierhaus. *Stahl und Eisen,* v. 70, Apr. 27, 1950, p. 372-375.

A new "ring-forging" process for producing cams on crankshafts that results in orientation of the structure in the direction of greatest stress. (F21, T25, ST)

135-F. A Note on the Optimum Shape of Wire-Drawing Dies. (In Polish.) M. Schneider. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa,* v. 1, No. 3, 1949, p. 213-231.

Theoretical principles were studied in order to standardize the shapes and sizes of sintered-carbide wire-drawing dies. Formulas are developed. 13 ref. (F28)

136-F. Calculation of Rolling-Mill Roll Pressure. (In Polish.) Z. Wusatowski. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa,* v. 1, No. 3, 1949, p. 233-290.

A comprehensive treatise in four parts: Basic principles of plastic deformation; theoretical calculation of roll pressure; empirical calculation of roll pressure; and calculation of roll pressure from roll flattening and tension. The various methods are critically analyzed and typical results compared. 176 ref. (F23)

137-F. A Photoelastic Dynamometer for Rapidly Varying Forces. E. Orowan, F. H. Scott, and C. L. Smith. *Journal of Scientific Instruments,* v. 27, May 1950, p. 118-122.

Dynamometer consists of a glass slab upon which the force acts, placed between crossed polarizers; the intensity of the transmitted light is a measure of the force. It has been used for recording the variation of pressure over the area of contact in rolling mill research. Compared with piezoelectric methods, it has the advantages of stability and of applicability to moving components without the necessity of using slip-rings. (F23, S18)

138-F. Cold Drawing. I and II. L. Sanderson. *British Steelmaker,* v. 16, Mar. 1950, p. 128-131; Apr. 1950, p. 184-187.

March installment: Pickling and cold drawing of steel rods, bars, or coils. April: Cold drawing of wire. (To be continued.) (F27, F28, L12, ST)

G

SECONDARY MECHANICAL WORKING

168-G. Cold Extrusion of Steel; A New Horizon in Metalworking. J. Parker Bowden. *Steel Processing,* v. 36, May 1950, p. 227-233. (A condensation.)

Development of cold extrusion process by Heintz Mfg. Co., Philadelphia, on the basis of information and equipment received from Germany. The lubricant system and basic types of extrusion. Data for ultimate strengths of extruded ingot iron and various carbon and alloy steels. Experimental production of specific items. (G5, Fe, ST)

169-G. Meet the Bug Wire Weavers. Thorp McClusky. *Steelways,* v. 6, May 1950, p. 29-32.

Equipment and procedures for weaving of wire cloth and insect screening at seven factories in York County, Pa. (G6)

170-G. Charts Simplify Calculations. Part 2. Punching Power and Drawing Forces. Tyler G. Hicks. *Machine Design,* v. 22, May 1950, p. 129-130.

Includes worked examples. (G1)

171-G. Use the Right Machining and Drawing Fluids To Improve Production Efficiency. E. L. H. Bastian. *Steel,* v. 126, May 29, 1950, p. 58-62, 80, 83.

The various types, their advantages and disadvantages, properties, and applicabilities. (G21)

172-G. Let's Talk About Carbides. *Industrial Diamond Review,* new ser., v. 10, Apr. 1950, p. 107-110. Extracted from *Blue Chips* (Warner & Swasey Co.), v. 4, 1948, p. 41-43, 46, 49-51, 62-63.

Effects of various factors on carbide cutting-tool performance. Tests were made on hot rolled SAE 1020 steel. Effect of tool shape on tool life, cause and effects of cracks in tool tips, effect of change in work diameter, effects of heat on tool life, effects of chip impact, and effects of differences in the steel. (G17, T6, CN, C)

173-G. Comparison Charts for Sintered Carbide Grades. *Industrial Diamond Review,* new ser., v. 10, Apr. 1950, p. 111-113.

Charts for commercial types produced in the U.S. and England. (G17, T6, C)

174-G. Automotive Sheet Metal Screws. Albert Wright. *Western Machinery and Steel World,* v. 41, May 1950, p. 80-81.

Production by California Fasteners Co. for Ford, Lincoln, and Mercury. Coldheading, wiredrawing, and thread rolling equipment (G10, G12, F28, T7)

175-G. Rolled Formed Sections. Howard A. Burleson. *Western Machinery and Steel World,* v. 41, May 1950, p. 82-83.

Production for Ford cars by Western Mouldings & Stampings, Inc., Ontario, Calif. (G11, T21, ST)

176-G. Press Work at General. Elmer L. Lipp. *Western Machinery and Steel World,* v. 41, May 1950, p. 96-97.

Mass production of stamped automotive parts for Ford Motor Co. by General Machine Works in California. (G1, T21)

177-G. Fasteners Require Quality Too. Samuel M. Washabaugh. *Western Machinery and Steel World,* v. 41, May 1950, p. 102-103.

Manufacture of miscellaneous fasteners by National Screw & Mfg. of Calif. (G17, G10, T7)

178-G. A Machinability Test for Treated Cast Iron. E. A. Loria and R. L. Keller. *Iron Age,* v. 165, June 1, 1950, p. 73-76.

Shows that thin-section gray-iron castings are susceptible to surface hardening effects that lower machinability. Use of silicon carbide cupola addition agents lessens chilling tendency and improves machinability. Tests show increases in tool life of 50-100%. (G17, E10, CI)

179-G. Character and Performance of MX Bessemer Steels. George R. Caskey. *Screw Machine Engineering,* v. 11. June 1950, p. 30-39.

Previously abstracted from "Superior Machining at Lower Cost with MX." *Iron Age.* See item 166-G, 1950. (G17, Q23, CN, SG-k)

180-G. Hot-Stamping the "Superalloys". William Van Den Akker. *Aero Digest,* v. 60, June 1950, p. 33, 83.

Procedures at Stainless Steel Products Inc., for manufacturing parts for high-temperature service in gas turbines, jet engines, rocket engines, etc. Superalloys contain a large number of alloys with or without the predominance of Fe. (G3, SG-h)

181-G. Cold Roll Forming for Mass Production of Shapes of Uniform Profile. E. J. Vanderploeg. *Metal Industry,* v. 76, May 19, 1950, p. 399-401, 406.
Recommended procedures, with emphasis on roll-pass design. (G11)

182-G. Concerning the Embossing of Metals. (In French and German.) P. Huguenin. *Pro-Metal,* v. 3, Apr. 1950, p. 587-601.
General types, methods, materials, coining, and embossing of various types of sheet metal. Various commercial Cu-base alloys suitable for this work. 11 ref. (G3, Cu)

183-G. Problems in the Standardization of Equipment for Oxygen Cutting. (In Russian.) A. N. Shashkov. *Avtogennoe Delo* (Welding), Feb. 1950, p. 28-31.
(G22)

184-G. Hardened Steel Milled With Carbide. Anderson Ashburn. *American Machinist,* v. 94, June 12, 1950, p. 94-95.
Machining operations on dies hardened to Rockwell C-62. Milling, drilling, boring, and counterboring are all done with carbide tools of special design. (G17, TS)

185-G. Rheem Forms 55-Gal. Drums After Color Lithography. L. A. Reber. *Iron Age,* v. 165, June 15, 1950, p. 99-103.
Rheemcote, or new fabricating technique which produces steel drums with accurately lithographed, multi-colored exteriors, and sanitary, non-corrosive interiors. Internal and external coatings are applied before forming operations which include shot blasting, resistance welding, roll forming into cylindrical shape, flanging and beading for heads and bottoms.
(G general, L26, ST)

186-G. Deep-Drawing of Stainless Steel on Transfer Type Presses. Charles H. Wick. *Machinery* (American), v. 56, June 1950, p. 162-165.
Technique for drawing deep, small-diameter cups from thin stainless-steel strip stock on transfer type presses. As many as eight progressive draws are made without intermediate annealing. (G4, SS)

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187-G. How Revere Checks Machinability. Harry Schagrin. *Steel,* v. 126, June 19, 1950, p. 84-86.
Rapid, accurate method for determining the machinability of free-cutting brass and other metals. The new quality-control technique measures and interprets minute movements a cutting tool makes under changes of cutting stresses.
(G17, S12, Cu, SG-k)

188-G. New Markets Open for Expanded Metal. *Inco,* v. 24, Spring, 1950, p. 16-17, 28; *Steel,* v. 126, June 19, 1950, p. 104, 107.
Mesh and screening produced by simultaneous slitting and expanding of sheet monel, Inconel and other Ni alloys. (G15, T10, Ni)

189-G. Electric Spark Machining. I. Koncz. *Engineers' Digest,* v. 11, Apr. 1950, p. 108-111; May 1950, p. 165-168. Translated and condensed from *Gép* (Hungary), v. 1, Sept.-Oct. 1949, p. 388-411.
Experimental equipment and procedure for machining and grinding hard alloys. In drilling a hole in a metal part, the part is connected to the positive pole of a d.c. source. The electrode periodically contacts the part and causes the condenser to discharge. The discharge takes the form of a spark at the point of contact, which becomes quenched by a liquid covering the part. Each spark discharge removes some of the material. Evaluation of oscillograms, mechanism of spark machining, accuracy of measurements, and industrial possibilities. (G17)

190-G. Powder-Cutting and Scarfing Processes. Rodger S. Babcock. *Blast Furnace and Steel Plant,* v. 38, June 1950, p. 674-680.
Chemistry, apparatus, operation of power equipment, metallurgical aspect, applications of powder process in the foundry, heavy cutting of scrap, and conditioning by powder scarfing. (G22)

191-G. The Design of Cylinders by Autofrettage. W. R. D. Manning. *Engineering,* v. 169, Apr. 28, 1950, p. 479-481; May 5, 1950, p. 509-511; May 19, 1950, p. 562-563.
"Autofrettage" is a means of achieving stress distribution by overstraining the tube by internal pressure, and then annealing it at a low temperature. A proposed method for applying autofrettage to general problems of design, which involves preparation of special charts, has not yet been fully tested, but appears to be accurate enough for most purposes. Applicability to various metals and alloys. (G23)

192-G. (Book) **Pruefen der Zerspanbarkeit durch Messung der Schnittemperatur.** (Testing of Machinability by Measurement of Cutting Temperature.) M. Lang. 119 pages. 1949. Carl Hanser Verlag, Munich 27, Germany. 8.20 DM.
Surveys the most important rapid testing methods for determining cutting temperature. Sources of error in temperature measurement.
(G17, S16)

H
POWDER METALLURGY

47-H. Powder Parts Invade the Appliance Field. D. W. Lynch and T. J. Snodgrass. *Iron Age,* v. 165, June 8, 1950, p. 83-86.
High strength gears made of copper-impregnated powdered iron, which have replaced malleable iron castings in the gear train of an automatic washer. Savings of 60-70% have been realized. Mechanical properties of various alloys are tabulated and discussed. (H16, T7, Fe)

48-H. Metallurgical Aspects of Presintering and Sintering Cemented Carbides. Geoffrey Edwin Spriggs. *Journal of the Birmingham Metallurgical Society,* v. 30, Mar. 1950, p. 5-25.
In the presintering operation, Cobalt recrystallizes and welding of Co and possibly of carbide particles takes place without the formation of a liquid phase, which gives the compacts enough strength for grinding or machining. In the sintering process, a liquid phase is formed which consists of WC dissolved in Co and produces a considerable amount of contraction filling the voids. On cooling, dissolved WC is re-precipitated and deposited on undissolved grains thus causing grain growth. At room temperature the amount of carbide left in solid solution is less than 1% so the matrix is quite ductile consisting of nearly pure Co. The final product is extremely dense and hard. 13 ref. (H15, Co, W, C)

49-H. Preparation of Metal Carbides. Part I. G. F. Hüttig, V. Fattinger, and K. Kohla. *Powder Metallurgy Bulletin,* v. 5, May 1950, p. 30-37.
Effect of gas atmospheres on the formation of carbides, particularly W and Mo carbides. (To be continued.) (H10, W, Mo, C)

J
HEAT TREATMENT

128-J. Martempering of Automotive Gears and Shafts. S. L. Widrig and Wilson T. Groves. *Metal Progress,* v. 57, May 1950, p. 607-612.
Martempering is usually regarded primarily as a means of improving the toughness of hardened parts. It was found that it also avoids distortion so satisfactorily that automotive gears, of carburized low-alloy steel, ordinarily press or plug quenched, can be martempered successfully in production in oil at 350° F. (J26, T7, AY)

129-J. Practical Controlled-Atmosphere Furnace Applications Reduce Heat Treating Costs. O. E. Cullen. *Steel,* v. 126, May 22, 1950, p. 74-76, 100.
Choice of atmosphere-generating equipment and furnaces for various applications. (J2)

130-J. Getting More Out of Heat Treating. Part II. Howard E. Boyer. *Steel Processing,* v. 36, May 1950, p. 251-253, 256.
Concludes elementary explanation of basic principles involved in heat treatment of steel. Isothermal heat treatment and its modifications. Typical photomicrographs show steel in different conditions of heat treatment. (J general, ST)

131-J. Protective Atmospheres in Industry. Part XVI. (Concluded.) A. G. Hotchkiss and H. M. Webber. *General Electric Review,* v. 53, May 1950, p. 26-30.
Procedures for correcting conditions that sometimes lead to undesirable effects. Numerous practical suggestions for applying remedies. (J2)

132-J. A Study of the Carburization Process With Special Reference to Gas Carburizing. D. S. Laidler and J. Taylor. *Journal of the Iron and*

Steel Institute, v. 165, May 1950, p. 23-39.

Development, as a result of comprehensive experiments on both laboratory and semi-works scales, of a successful carburization process, using town gas as the carburizing medium. Mechanism of the carburization process in the light of experimental carburizations in pure CO. Variables considered are steel composition, temperature, surface activation, and gas velocity. Gas-reaction/time and carbon-absorption/time curves. Case-depth/time curves for a number of steel and different temperatures, and diffusivity coefficients. New method for reducing O_2 and CO_2 by passing the gas over a barium-compound catalyst. 16 ref. (J28, ST)

133-J. Quenching Media; Experimental Studies of Evaluation by the Jominy Test. Howard E. Boyer. *Iron and Steel*, v. 23, May 1950, p. 177-180.

Data were obtained by reversing the principle of the normal Jominy test; that is, steels of known hardenability value were heated and quenched by means of quenching media which varied in composition and temperature. Apparatus designed for the new method; photomicrographs show typical structures obtained. (J2, ST)

134-J. Transfer of Material Between Furnace Atmosphere and Furnace Charge. (In German.) Walter Litterscheidt. *Gas- und Wasserfach*, v. 91, Apr. 15, 1950, p. 79-82.

The various ways in which the furnace atmosphere can affect iron or steel during heat treatment. These effects can be oxidation and reduction, carburization and decarburization, as well as hardening effect of decomposing NH_3 (nitriding). (J2, ST)

135-J. Directions for Autogeneous Surface Hardening. (In German.) K. Boeckhaus. *Schweissen und Schneiden*, v. 2, Apr. 1950, p. 73-78.

Equipment for surface hardening various shapes and metal forms. (J2, ST)

136-J. Methods of Measuring Case Depth. *American Machinist*, v. 94, May 29, 1950, p. 101, 103.

A recommended practice that will appear in the 1950 edition of SAE Handbook. (J28)

137-J. Profitably Operating the Small Commercial Heat Treating Plant. Olin Rutledge. *Industrial Heating*, v. 17, May 1950, p. 804-806, 808, 922, 924, 926, 928.

Equipment and procedures of Columbus Steel Treating Co., Columbus, Ohio, and Zanesville Steel Treating Co., Zanesville, Ohio. (J general, A5, ST)

138-J. Heat Treating Shakeproof Fastenings. J. Wallerius. *Industrial Heating*, v. 17, May 1950, p. 810, 812, 814, 816.

Equipment and procedures of Shakeproof, Inc. Miscellaneous carbon steel washers, clips, nuts, and bolts are treated. (J general, T7, CN)

139-J. Safety Procedures for Protection Against Flammable Atmosphere Hazards of Special Atmosphere Furnaces. II. *Industrial Heating*, v. 17, May 1950, p. 818, 820, 822, 824.

Recommended procedure when explosive mixtures cannot always be avoided because the process requires turning on and off the special atmosphere while the furnace is cold and when an inert-gas purge is not practical; protection against interruption of flow of special atmosphere; and special atmosphere generator safeguards. (J2)

140-J. Controlled Cooling of Steel Blooms in Car Bottom Furnaces. *Industrial Heating*, v. 17, May 1950, p. 826, 828, 830. Based on paper by C. J. F. Burch.

Use of cycle annealing of alloy steel blooms to prevent formation of internal cracks known as flakes. By this method, conditioning costs were reduced. Defects were removed by chipping instead of grinding. (J23, AY)

141-J. Esco Water Quench Increases Casting Speed and Uniformity. James Thomas Gow. *Western Metals*, v. 8, May 1950, p. 24-25.

Method developed by Electric Steel Foundry, Portland, Ore. Table gives mechanical properties of "Esco Alloy 12M" after four different heat treatments, showing superiority of new method. (J26, AY)

142-J. Heat Treatment of Alloy Steels. C. E. McDermott. *Industrial Heating*, v. 17, May 1950, p. 790-792, 794, 796, 798.

Definitions and simple explanations of various heat treating terms. Also their metallurgical background. (To be continued.) (J general, AY)

K

JOINING

310-K. Rigid Tests Check Quality of Pressure Welds in Low Alloy Steels. A. I. Nussbaum. *Materials & Methods*, v. 31, May 1950, p. 80-82.

Simulated service and physical tests, and metallographic inspection procedures, used to assure reliable welds of maximum strength in aircraft landing gear. (K2, K9, T24, AY)

311-K. Brazing of Steel. (Concluded.) **Part III. Metallurgy of Brazing.** S. L. Case. *Steel Processing*, v. 36, May 1950, p. 238-243, 257, 265.

Function of brazing flux; nature of bond between base metal and filler alloy; effect of film thickness of filler metal and brazing temperature on joint strength; strength of brazed joints at elevated temperatures; origin of "voids" in brazed joints; detection of "voids"; variables influencing "void" formation; and effect of "voids" on braze quality. 15 ref. (K8, ST)

312-K. Hermetically Sealed Cast-Glass Bushings. T. C. Aitchison and H. Brunton. *General Electric Review*, v. 53, May 1950, p. 39-42.

Development of methods used for joining cast-glass bushings to metal components by soldering, brazing, or welding. Illustrated. (K11)

313-K. Aluminum Brazing. T. J. Palmer. *Metallurgia*, v. 41, May 1950, p. 357-361.

In the fabrication of Al alloys, increasing use is being made of a "brazing" process using an Al-Si eutectic alloy as the joining material. Relative merits of soldering, brazing, and fusion welding. The brazing operation. (K8, Al)

314-K. All-Welded Storage Vessels. *Welding*, v. 18, May 1950, p. 187-198.

Various designs and details of their fabrication. Confined to structural steel. (K1, T26, CN)

315-K. Are We Prisoners of Old Ideas? R. Weck. *Welding*, v. 18, May 1950, p. 223-227.

Lecture contains a number of challenging comments on current ideas of welding design and practice. (K general)

316-K. Determination of the Temperature Field in Welding With the Aid of Measuring Colors. (In German.) A. Matting. *Schweissen und Schneiden*, v. 2, Apr. 1950, p. 68-73.

Variations in temperature gradients with distance from the weld in gas and arc welding of Cu sheets of different thicknesses and of Cu-plated sheet steel were investigated, using colors produced as an indication of temperature zones. Results recorded by color photography, show that thermal diffusion is considerably less in electric-arc welding than in gas welding. 10 ref. (K1, K2, S16, Cu, CN)

317-K. Rubber-Metal Bonding According to the "Megum" Process. (In German.) G. Hanke. *Kautschuk und Gummi*, v. 3, Apr. 1950, p. 126-128.

The various methods for applying adhesives, effect of different components on adhesive strength of the adhesives, and attainable bonding strengths at −45 to 100° C. (K11)

318-K. Calculation of Parameters of Temperature Variations of the Base Metal During Multi-Layer Arc Welding. (In Russian.) N. N. Rykalin and I. D. Kulagin. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Feb. 1950, p. 233-248.

How to calculate the thermal cycle during multi-layer arc welding on the basis of theory and experiment. A method for control of the decomposition of supercooled austenite in the recrystallization zone is indicated. Methods of calculation developed constitute a basis for rational selection of conditions of multi-layer welding of low-alloy structural steels. (K1, AY)

319-K. Welding of Zinc Base Alloy Die Castings. Roland H. Ogden. *Welding Journal*, v. 29, June 1950, p. 453-457.

Techniques for repairing die castings by gas welding. 10 ref. (K2, Zn)

320-K. The Aircomatic Welding Process. A. Muller, G. J. Gibson, and E. H. Roper. *Welding Journal*, v. 29, June 1950, p. 458-482.

Fundamentals of metal-arc transfer in inert-gas-shielded arc welding. Methods of overcoming porosity in Al welding by automatic and manual welding, as well as stainless steel, heat resisting alloys, clad materials, and aluminum bronze. Specific applications. 13 ref. (K1, Al, SS, SG-h)

321-K. Trends in Fabrication by Welding. S. V. Williams. *Welding Journal*, v. 29, June 1950, p. 483-487.

Selection of materials, design, fabrication procedures, production schedules, testing, and cost accounting. (K general)

322-K. Production Butt and Flash Welding. H. J. Chamberland. *Welding Journal*, v. 29, June 1950, p. 488-490.

Automatic control of welding cycle and selective annealing heats for saw bands and steel tape. (K3, AY)

323-K. Welding Galvanized Iron. F. J. Pilia. *Welding Journal*, v. 29, June 1950, p. 491-492.

Welding with regard to protection of the Zn coating. (K general, Zn, Fe)

324-K. Shrinkage Distortion in Welding. W. Spraragen and W. G. Ettinger. *Welding Journal*, v. 29, June 1950, p. 292s-294s.

Systematizes information available in the literature in the form of charts and formulas with suitable correction factors. (K general)

325-K. A Torsion Test for Spot Welds. *Welding Journal*, v. 29, June 1950, p. 302s.

Apparatus and procedures for carbon steels having a tensile strength of 64,000 psi. (K2, Q1, CN)

326-K. Aircomatic Welding—A Pro-

duction Tool. *Western Machinery and Steel World,* v. 41, May 1950, p. 106-107.

Automatic inert-gas shielded-arc welding of Al, Al bronze, stainless steel and other metals and alloys. (K1, Al, Cu, SS)

327-K. Stud Welding Lowers Costs as New Uses Are Found in Western Manufacture. Ludwig B. Kellerman. *Western Metals,* v. 8, May 1950, p. 26-28.

Stud welding at Ajax Boiler Co., Los Angeles. (K1, T25, ST)

328-K. The Induction Heater as a Tool in Fabrication. Gilbert C. Close. *Finish,* v. 7, June 1950, p. 19-21, 64.

Use of induction brazing in fabrication of miscellaneous products. (K8)

329-K. Weldability of Piping Materials. *Heating Piping & Air Conditioning,* v. 22, June 1950, p. 78-81.

Characteristics of carbon steel, alloy steel, Al, Cu, Ni, and Pb piping materials which affect their welding. (K9, AY, CN, Al, Cu, Ni, Pb)

330-K. Modern Soft-Soldering Technique. R. W. Hallows. *Wireless World,* v. 56, June 1950, p. 217-219.

Soldering of electrical apparatus, which depends upon flux, suitable Sn-Pd solder, and temperature. (K7, T1)

331-K. Evaluation of Several Adhesives and Processes for Bonding Sandwich Constructions of Aluminum Facings on Paper Honeycomb Core. H. W. Eickner. *National Advisory Committee for Aeronautics,* Technical Note 2106, May 1950, 23 pages.

Tension tests were made at 80 and 200° F. on sandwich specimens of 1-in. 17S-T4 Al alloy cubes bonded to a resin-impregnated paper honeycomb core; 6 of 14 bonding processes gave good-quality bonds. Four processes giving the best results were used in a further investigation to determine the effect of amount of adhesive spread on tensile strength. All produced good joints between facing and core when moderately heavy spreads were applied to both. (K11, Al)

332-K. Holdings in the A. F. Davis Welding Library. Robert S. Green. *Engineering Experiment Station, Ohio State University,* Circular No. 51, 1950, 37 pages.

(K general, A10)

333-K. From a Metallurgist's Notebook: Faulty Brazing. H. H. Symonds. *Metal Industry,* v. 76, May 12, 1950, p. 385, 389.

Domestic copper hot-water boilers which were found to be leaking at a brazed joint were investigated. From sections taken through various regions, it was found that failure was due primarily to faulty brazing. An increase in the amount of overlap on the joints is also suggested. (K8, R4, Cu)

334-K. Electric Welding of Copper and Its Alloys. (In German.) Ernst Hawlik. *Schweisstechnik,* v. 4, Mar. 1950, p. 29-32.

A brief outline for the practicing welder. (K1, Cu)

335-K. Automatic Welding Under Flux of "Chromansil" Steel of 2, 3, and 4-Mm. Thicknesses. (In Russian.) N. T. Azarenko. *Avtogennoe Delo* (Welding), Feb. 1950, p. 1-4.

Experimentally investigated for a steel containing 0.32% C, 0.99% Si, 0.04% Mn, 0.018% S, 0.03% P, and 0.86% Cr. Optimum flux material, electrode wire, and welding conditions. It was found that butt joints on copper and steel backing show best characteristics for 3 and 4-mm. thickness, and steel backing for the 2-mm. thickness. Mechanical properties of the welds and weld macrostructures. (K1, AY)

336-K. Manual and Automatic Argon-Arc Welding of Thin "30KhGSA" Sheet Steel. (In Russian.) A. Ya. Brodskii and A. V. Petrov. *Avtogennoe Delo* (Welding), Feb. 1950, p. 14-18.

Experimental investigation of various factors involved in argon-arc welding techniques. Includes study of joint design, of additions of diatomic gases, of electrode compositions, and of welding conditions. Mechanical properties of the welds and optimum techniques. (K1, AY)

337-K. Strength of Seams Resulting From Manual Arc Welding With Deep Penetration. (In Russian.) Ya. M. Likhtarnikov. *Avtogennoe Delo* (Welding), Feb. 1950, p. 18-21.

Physical and mechanical properties of welds in steel obtained with different welding techniques, electrode compositions, and thicknesses of base metal are tabulated and charted. (K1, Q general, ST)

338-K. "We Built a Boat". Harry W. Pierce. *Welding Engineer,* v. 35, June 1950, p. 17-22.

Fabrication of a yacht with a welded steel hull.
(K general, T22, CN)

339-K. Welding, Brazing, Soldering Beryllium Copper. I. John T. Richards. *Welding Engineer,* v. 35, June 1950, p. 23-27.

Physical and mechanical properties, heat treatments, soft soldering, and types of solders and fluxes. Effect of heat on microstructure. (To be continued.) (K7, J general, P general, Q general, Cu)

340-K. Defects in Stainless-Steel Spot Welds. Paul F. Duvall, Robert S. Smith, and Frank E. Craig. *Welding Engineer,* v. 35, June 1950, p. 30-31, 35.

Setup found acceptable by I-T-E Circuit Breaker Co. for producing quality welds. (K3, SS)

341-K. Production Hard-Facing of Rock Drills. Gerald Eldridge Stedman. *Welding Engineer,* v. 35, June 1950, p. 32-35.

Welding and hard facing procedures used by Gardner-Denver Co. (K general, L24, T6, ST)

14,627 Welding Buyers will come to Chicago the week of October 23.

Over 30,000 metal men will attend the National Metal Exposition and nearly half of them will want to see welding equipment, accessories and supplies on display. 8,363 will want to see Acetylene Cutting Equipment and 11,103 want to see Brazing Equipment. Over 300 leading manufacturers have already reserved space so they can meet these executives, metals engineers and buying officials.

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342-K. Inlays Welded on Old Turbine. *Welding Engineer,* v. 35, June 1950, p. 43.

Repair of old stainless steel turbine runner where the trailing edges of the buckets were pitted. (L24, T25, SS)

343-K. Weld Defect Chart. *Welding Engineer,* v. 35, June 1950, p. 49.

Typical defects found in spot welding austenitic stainless steels, and prevalent causes for their occurrence in order of their importance. (K3, SS)

344-K. Aluminum Welding by Argon Metal Arc. *Petroleum Refiner,* v. 29, June 1950, p. 134.

An electric welding process in which the arc is maintained in a shield of argon gas between a filler metal electrode and the Al workpiece. (K1, Al)

345-K. All Welded Utility Trailer. Bruce M. Smith. *Industry & Welding,* v. 23, June 1950, p. 22-24.

Design and procedure used in fabricating trailer for domestic use. (K general, T21, CN)

346-K. Inert-Gas Shielded-Arc Welding in the Automotive Industry. R. H. Bennewitz and J. J. Pilia. *Industry & Welding,* v. 23, June 1950, p. 26-27.

Use for body parts. (K1, T21, ST)

347-K. Atomic-Hydrogen Welding in the Salvage and Repair of Tool Steels and Dies. Robert L. Kohlbry. *Industry & Welding,* v. 23, June 1950, p. 28, 30.

Procedure and results. (K1, TS)

348-K. The Ability of this "Transportainer" To Safely Carry Six Tons of Cargo Proves that Spot Welded Primary Structural Members Are Dependable. C. Broner. *Industry & Welding,* v. 23, June 1950, p. 32-34.

Weld fabrication of low-alloy steel shipping containers at Dravo Corp. Some experimental work has been done on aluminum.
(K general, T10, AY, Al)

349-K. Welding Hits the Road. A. H. Homrighaus, Jr. *Industry & Welding,* v. 23, June 1950, p. 36-37, 60.

Use of oxy-acetylene, metallic-arc and inert-gas shielded-arc welding in fabricating aluminum trailer and semi-trailer trucks. (K1, K2, T21, Al)

350-K. The House That Jack Built. J. B. McCormick. *Industry & Welding,* v. 23, June 1950, p. 41, 44, 47.

Five-room house with a welded steel frame. (K general, T26, CN)

351-K. The Control of Distortion in Arc Welding. R. G. Braithwaite. *Transactions of the Institute of Welding,* v. 13, Apr. 1950, p. 64-70.

For mild steel structural assemblies. Electrodes, butt welding, balancing welding, glanding, shrinkage in plate girders, and thermal properties of steel. (K1, T26, CN)

352-K. Preliminary Tests on Welded Connections. E. K. Frankl. *Welding Research,* v. 4 (bound with *Transactions of the Institute of Welding,* v. 13), Apr. 1950, p. 27r-32r.

Reviews the literature and describes testing procedure suitable for the examination and testing to destruction of full-scale beam-to-column connections. A few selected types were investigated. 20 ref. (K9, CN)

353-K. (Book) Fasteners Data Book. 200 pages. 1950. Industrial Fasteners Institute, 3648 Euclid Ave., Cleveland 15, Ohio. $3.75.

Consists of reprints of the more important articles which have appeared in *Fasteners.* Topics include bolt and rivet design, locknuts, strength tests on various fasteners, proper torque in bolt tightening, and related subjects. (K13)

354-K. (Book) Resistance Welding in Mass Production. A. J. Hipperson

and T. Watson. 278 pages. Iliffe & Sons Ltd., Dorset House, Stamford St., London S.E. 1, England. 21s. ($4.75)

Covers first principles of each process to its scientific application in mass production. Selection of various processes—pot, projection, seam, flash and butt welding; hot riveting; control equipment for resistance welders; recommended machine settings; testing and inspection of welded joints; and resistance welding costs. Includes bibliography. (K3)

355-K. (Book) Questions and Answers on Electric Arc Welding. E. Crawford. 112 pages. George Newnes, Ltd., Tower House, Southampton St., Strand, London W.C.2, England. 5s.

A pocket-sized handbook containing information in the form of answers to everyday questions. (K1)

L

CLEANING, COATING AND FINISHING

364-L. Tumbling for Low-Cost Finishing. Adolph Bregman. *Metal Progress,* v. 57, May 1950, p. 625-628, 680, 682, 686, 688, 690, 692, 694.

General principles, procedures, and equipment. Characteristics of the carrier or rolling medium and of the finishing compounds (abrasives, lubricants, cleaners, and corrosion inhibitors). Dry tumbling. Recommends wider application of tumbling. (L10)

365-L. Fishing Tackle Britehoned and Plated. Herbert Chase. *Iron Age,* v. 165, May 25, 1950, p. 75-77.

Equipment and procedures. Britehoning consists of two phases—polishing and honing—both conducted in the same barrel with the same chips, but with a different compound. Parts are chiefly brass and stainless steel, but some are also nickel, silver, and aluminum. (L10, Cu, SS, Al)

366-L. Hardfacing. F. W. Weigel. *Machine Design,* v. 22, May 1950, p. 126-128.

Provision for hard facing in original design results in greatly increased capacity and service life. Hard facing of a worm shaft for a large mechanical screw press. (L24, ST)

367-L. Finishing Door Chimes at the Nutone Factory. William R. Cutter. *Industrial Finishing,* v. 26, May 1950, p. 48-50, 52, 54, 56, 58.

Equipment and procedures. Parts are brass, steel, and aluminum. Includes preliminary surface treatment. (L general, Cu, ST, Al)

368-L. Electric Burn-Off Oven Cleans Metal Stampings. J. I. Kolb. *Industrial Finishing,* v. 26, May 1950, p. 70-72, 74.

Automatic cleaning of stamped sheet-metal parts for floor furnaces. (L12)

369-L. Adherence of White Titanium Enamels to Ti-Namel, Effect of Nickel Deposition, Enamel Thickness and Extra Firing. J. E. McFarland. *Better Enameling,* v. 21, May 1950, p. 6-12.

Experimental data. "Ti-Namel" is a special Ti-bearing enameling steel. (L27, AY)

370-L. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 21, May 1950, p. 33.

Porcelain-enamel defect known as chipping; causes and remedies. (L27)

371-L. Weirton Starts New Electrolytic Tinning Line. *Iron and Steel Engineer,* v. 27, May 1950, p. 99-101. (L17, Sn, CN)

372-L. Recent Technical Developments in the Vitreous Enamelling of Light Alloys. R. P. Fraser, A. L. Cianchi, and J. M. Connor. *Sheet Metal Industries* v. 27, May 1950, p. 451-459.

Application of vitreous enamel to Al; vitreous enamels containing Pb; leadless enamels for Al; and other practical considerations. (L27, Al)

373-L. Applications of Electrostatic Spraying and Detearing in Metal Finishing. John Stribley. *Sheet Metal Industries,* v. 27, May 1950, p. 460-466.

The processes, their principles and functions, and their particular application to large-scale industrial finishing. (L26)

374-L. Soft Grits Provide Low Cost Method for Blast Cleaning Metals. T. F. Clark and E. C. Lathrop. *Materials & Methods,* v. 31, May 1950, p. 67-69.

How grits from agricultural residues, such as corncobs, rice and nut shells, can be used in conventional blasting equipment for degreasing, removing welding scale, and cleaning metal surfaces prior to plating. (L10)

375-L. Vinyl Protective Film. E. E. Halls. *Aircraft Production,* v. 12, May 1950, p. 176-177.

Some notes on applications and properties of plastic coatings for metals. (L26)

376-L. Protection of Magnesium Alloys. E. E. Halls. *Electroplating and Metal Finishing,* v. 3, May 1950, p. 339-346.

Comparative data on the corrosion resistance afforded by various types of organic finishes and chemical pretreatments. (L14, L26, R general, Mg)

377-L. Anticorrosive Coatings. *Paint, Oil, and Chemical Review,* v. 113, May 25, 1950, p. 45. Condensed from paper by A. G. Sussex, *Australian Paint Notes,* v. 4, 1949, p. 348-357.

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The Metal Show will bring over 30,000 officers, metals engineers and buying officials to Chicago in October. '49 Show visitors were asked what they want to see—12,811 said Protective Coatings and 10,640 said Metal Cleaning Equipment. A display at the Metal Show will put your products before them.

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Discusses the above from the corrosion engineer's viewpoint. (L26, R general)

378-L. From a Metallurgist's Notebook: Anodized Aluminum. H. H. Symonds. *Metal Industry,* v. 76, May 5, 1950, p. 345-346.

Fading of an anodized Al panel was believed to be caused by the action of sunshine or effects of abrasion on cleaning. Tests were carried out on similar plates to examine fading after exposure to ultraviolet radiation of varying intensity. Conclusions as to the behavior of various finishes on such panels under these conditions. 18th report of series. (L19, Al)

379-L. New Finish for the Decoration and Protection of Aluminium. John M. Perfect. *Light Metals,* v. 13, May 1950, p. 235-239.

Advantages of finish developed by alumilite and Alzak, Ltd., in Britain, and known as "Enamel Plating". (L26, Al)

380-L. Electrical Resistance of the Anodic Layer and Optimum Composition of Electropolishing Baths. (In French.) E. Darmois, I. Epelboin, D. Amine, and C. Chalin. *Revue de Métallurgie,* v. 47, Mar. 1950, p. 183-186.

Influence of composition of the electropolishing bath on electrical resistance of the anodic layer was investigated for Armco iron, 50-50 Fe-Ni, 76% Ni Permalloy, and Mond nickel. On the basis of the results, use of these values for determination of optimum composition of electrolytes for electropolishing is proposed. (L13, Fe, Ni)

381-L. A New Method of Thermal Chromizing and Formation of Mixed Alloys as a Result of Diffusion. (In French.) P. Galmiche. *Revue de Métallurgie,* v. 47, Mar. 1950, p. 192-200.

Existing methods for chromizing, and a new method applicable to low-carbon steel and to nonferrous alloys. Anticorrosion properties of metals and alloys chromized by the new method. Formation of alloys near the surface layer during chromizing. Applications of the method. 16 ref. (L15, CN, Cr)

382-L. Unsuitable Ferrous Surfaces for Hot Galvanizing. (In German.) Heinz Bablik. *Metalloberfläche,* sec. A, v. 4, Apr. 1950, p. 49-53.

The most common causes of defective hot-dip Zn plating. Recommends that cast iron be decarburized at the surface to obtain good adherence and diffusion between Zn and Fe. (L16, CI, Zn)

383-L. Rust-Preventive Effects of Red Lead, Graphite, and Iron Oxide Mixtures. (In German.) Kurt Basting. *Metalloberfläche,* sec. A, v. 4, Apr. 1950, p. 54-61.

Experiments were made to test the relative effectiveness of above mixtures dispersed in two different types of lacquer. (L26, Fe)

384-L. Effects of Inhibitors on the Acid Pickling of Steel. Part II. (In Polish.) M. Smialowski, J. Synowiec, and M. Szota. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa,* v. 2, No. 1, 1950, p. 31-35.

Ten kinds of structural steel were investigated with respect to inhibition efficiency of dibenzylsulfide in H_2SO_4 at 40° C. Results could not be satisfactorily correlated. Further experiments were made on mixtures of electrolytic Fe powder with 2% Ni or Cu powder added. Rate of H_2 evolution from $2N$ H_2SO_4 solution was investigated as a function of time and inhibitor added. Adsorption of aniline and diphenylamine (weak H_2SO_4 inhibitors) on electrolytic Fe powder was then studied. Shows how amount adsorbed can be

accurately determined colorimetrically. (L12, ST)

385-L. A Comparison of Warpage and Crossbending Test Results. D. R. Goetchius and E. E. Bryant. *Enamelist*, v. 27, Spring 1950, p. 7-9. (A condensation.)

See abstract of "Warpage and Cross-Bending Tests as Criteria of Resistance of Enamels Under Stress in Service," *Journal of the American Ceramic Society*. See item 199-S, 1950. (L27, S21)

386-L. Finishing of Aerocoach Buses Speeded in Radiant-Fired Forced-Convection Ovens. Arthur Q. Smith. *Industrial Heating*, v. 17, May 1950, p. 857-858, 860, 862, 864.

Metals involved are steel and aluminum. Illustrated. (L26, T21, ST, Al)

387-L. Silver and Aluminum Polishes. Cornelia T. Snell. *Chemical Industries*, v. 66, May 1950, p. 701-702, 704.

Various formulations and their properties. (L12, Ag, Al)

388-L. Creole-Shell Siburua Water Line Is Coated Inside by New Method. Robert L. Buck. *Oil and Gas Journal*, v. 49, May 25, 1950, p. 114, 116, 119.

Procedure developed for internal cleaning and coating of multiple-jointed steel pipe with hot pipe-line enamel. (L26, CN)

389-L. Choice of Electrodeposited Coatings. Clarence H. Sample. *Plating*, v. 37, May 1950, p. 482-484; June 1950, p. 618, 623-624, 633.

A general discussion. 38 ref. (L17)

390-L. A Hint for Hard Facing. E. H. Frail. *Welding Journal*, v. 29, June 1950, p. 492. (L24)

391-L. Armco Takes Wraps Off Sendzimir Galvanizing Process. K. Oganowski. *Iron Age*, v. 165, June 8, 1950, p. 71-74.

Sendzimir continuous galvanizing process which substitutes oxidation and reduction for pickling and requires no flux in zinc bath. Stressing accurate control, it yields a highly uniform product with a coating of tenacious adherence on iron and steel. (L16, Zn, ST)

392-L. Avoiding Enamel Difficulties Through Proper Furnace Operation. Part II. M. Bozsin. *Finish*, v. 7, June 1950, p. 22-24, 56.

Recommendations, mainly in connection with temperature control and instrumentation. (L27)

393-L. Filtration for Nickel and Neutralizer Solutions. Harold W. Faint. *Finish*, v. 7, June 1950, p. 25-26, 64.

Last of a series of three articles on filtration of solutions for paints and varnishes, plating solutions, and pickle-room solutions for porcelain-enameling installations. (L27)

394-L. Classification and Definition of Delayed Defects in Porcelain Enamels. J. H. Keeler, P. K. Chu, and H. M. Davis. *Finish*, v. 7, June 1950, p. 37, 60-61. A condensation.

Various defects are defined and catalogued. (L27)

395-L. Report of Committee B-8 on Electrodeposited Metallic Coatings. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 215-238.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 15. See item 8-187, 1949. (L17, S22)

396-L. Report of Committee D-1 on Paint, Varnish, Lacquer, and Related Products. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 305-317.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 51. See item 7A-83, 1949. (L26, S22)

397-L. Evolution of U. S. Tinplate Practice. R. E. Zimmermann. *Mining Journal* (London), v. 234, May 26, 1950, p. 549-550. (A condensation.)

Benefits of persistent research to producer and consumer, particularly in the U. S. Steel Corp. (L17, ST, Sn)

398-L. The Surface Quality of Hard-Chromium Plated Parts. (In German.) Walter Eilender, Heindrich Arend, and Heinz W. Dettner. *Metalloberfläche*, sec. A, v. 4, May 1950, p. 69-71.

It was found that the surface is rougher than that of parts plated with soft chromium. Recommends that parts be electropolished before plating and that a low current density be used. (L17, Cr)

399-L. Removing Grease With Lye in Metal Working. (In German.) Richard Justh. *Metalloberfläche*, sec. A, v. 4, May 1950, p. 72-76.

Chemistry involved in the removal of mineral oils and fats with different types of salts and alkalies. Especially recommends use of trisodium phosphate because it hardly corrodes the metal, yet is very soluble in water. (L12)

400-L. Technique of Preparation of Aluminum Alloys for Resistance Welding. (In Russian.) A. I. Prigachev. *Avtogennoe Delo* (Welding), Feb. 1950, p. 21-25.

Existing methods were investigated. Influence of different methods of surface treatment on the value of contact resistance and on the constancy of strength of the weld. Analysis of several chemical methods of surface treatment revealed that best results are obtained by dipping in an aqueous solution of orthophosphoric acid and a dichromate. (L14, K3, Al)

401-L. Aircraft Finishing Techniques Stress Utility. Gilbert C. Close. *Products Finishing*, v. 14, June 1950, p. 56-60, 62.

Protection of metal during storage and fabrication. Cleaning and finishing processes for Al and Mg. (L12, L14, L26, Al, Mg)

402-L. Recent Developments in Primer Coatings. Allen G. Gray. *Products Finishing*, v. 14, June 1950, p. 100, 102, 104, 106, 108, 110, 112, 114.

Deals with structural steel shop coat priming paint. Test procedure, pigmentations, and vehicles; test results. (L26, CN)

403-L. Blast Cleaning Cuts Fabrication Cost. *Steel*, v. 126, June 12, 1950, p. 94.

Setup which simplifies Al coating and bonding steel refrigerator components. (L10, ST)

404-L. Sendzimir Process Broadens Galvanized Sheet Applications. K. Oganowski. *Steel*, v. 126, June 12, 1950, p. 102, 104, 107, 110, 113.

Previously abstracted from "Armco Takes Wraps Off Sendzimir Galvanizing Process," *Iron Age*. See item 391-L, 1950. (L16, Zn, ST)

405-L. Soft Grits for Blast Cleaning. *American Machinist*, v. 94, June 12, 1950, p. 127.

Grits prepared from corn cobs, nut shells and fruit pits, used in conventional sandblasting equipment for efficient removal of paint, dirt, grease, carbonaceous deposits and scale without impairing the surface or dimensions of metal workpieces. (L10)

406-L. Hard Facing Drill Pipe. Wayne Eastwood. *Industry & Welding*, v. 23, June 1950, p. 38-39.

Procedure used by Buck's Welding Works, Signal Hill, Calif. (L24, ST)

407-L. Chemical Treatment of Die Castings Contributes to High Quality Organic Finishes. *Die Castings*, v. 8, June 1950, p. 45-48.

Treatments for Zn castings include conversion of the surface to a compound, phosphating, producing chromium salts on surface, chromating, etc. Merits of each treatment. Also treatments for magnesium, copper, brass, and lead castings. 18 ref. (L14, Zn, Cu, Mg, Pb)

408-L. Galvanizing Water Tanks at Hotpoint. John Wallerius. *Iron Age*, v. 165, June 15, 1950, p. 110-112.

Accurate control of cleaning and fluxing operations and of the zinc dipping process. Effect of furnace design and heat distribution characteristics on surface finish and cost. (L16, ST, Zn)

409-L. New Pickler Operates Like an Automatic Clothes Washer. *Inco*, v. 24, Spring, 1950, p. 26-28.

Machine has a sequence of hot and cold washings, rinses, and acid baths. (L12)

410-L. A Rapid Immersion Silvering Method of High Efficiency. P. B. G. Upton and E. F. G. Herington. *Research*, v. 3, June 1950, p. 289-290.

Method of depositing a silver film by reduction of a silver ammionionitrate solution with hydrazine sulphate, where the deposition of silver other than on the desired surface is prevented by the presence of pyridine. Comparable results are obtained by using cyclohexylamine or ammonia instead of pyridine if a small cetyl pyridinium bromide is added. (L16, Ag)

411-L. Watch Your Surface Finish. Part I. *Steel*, v. 126, June 19, 1950, p. 88-90, 115-116.

General discussion of terminology, costs, etc. Surface-finish measuring instruments. (L15)

412-L. Phosphorus Alloys Used in New Plating Method. *Steel*, v. 126, June 19, 1950, p. 99, 102.

Bureau of Standard's new process for electrodepositing alloys of phosphorus with Co or Ni. Easily deposited, the alloys are hard, corrosion resistant, and bright. (L17, Co, Ni)

413-L. Distribution of Hydrogen in the Steel-Enamel System. H. M. Davis, J. H. Keeler, and P. K. Chu. *Better Enameling*, v. 21, June 1950, p. 6-7. (A condensation.)

It is concluded that the immediate source of the hydrogen causing delayed defects and reboiling blisters in enamel is the steel base and that the hydrogen was dissolved or occluded in the metal prior to or during the enamel-firing step. Experimental observations on low-carbon steel. (L27, N16, CN)

414-L. A Study of Gases in Porcelain Enamelling. P. K. Chu, J. H. Keeler, and H. M. Davis. *Better Enameling*, v. 21, June 1950, p. 8-11. (A condensation.)

Gas samples as small as 10^{-8} cc. were analyzed, and an enclosed system was devised wherein an isolated enamel or an enamel with steel could be heated for the study of reactions and gas extraction. (L27, S11, CN)

415-L. An Examination of Reboiling. J. H. Keeler, P. K. Chu, and H. M. Davis. *Better Enameling*, v. 21, June 1950, p. 12-14. (A condensation.)

Reboiling is defined as a sudden appearance of blisters on the surface of ground coats, on sheet enameling iron, that may take place during the heating period on second or subsequent firing, the blisters disappearing again as the time of firing is extended. A temperature of 750° C. was used for the tests, and a commercial blue ground coat

as the standard coating material. Various enamels were tested with a low-metalloid rimmed steel. (L27, CN)

416-L. Trouble Shootin'. John L. McLaughlin. *Better Enameling*, v. 21, June 1950, p. 36-37.

Causes of reduced acid resistance and ways to improve acid resistance. Final installment of series on porcelain-enamel defects. (L27)

417-L. Electroplating of Wearing Parts. T. R. Boggess. *Railway Mechanical and Electrical Engineer*, v. 124, June 1950, p. 333-336.

Hard chromium plating of bearings, pistons, nozzles, wrist pins, crosshead guides, sealing rings, cylinder liners, hydraulic parts, valve shafts, gages, pumps, crankpin collars, gears, tools, etc., in the Norfolk and Western's Roanoke, Va., shops. (L17, T23, Cr)

418-L. Hydrogen Embrittlement in Nickel, Tin, and Lead Electroplating. C. A. Zapffe and M. E. Haslem. *Plating*, v. 37, June 1950, p. 610-613.

Quantitative measurements are reported for brittleness of mild-steel and low-carbon stainless-steel wires electroplated with Ni, Sn, Pb. Typical baths provided data for an evaluation of the scope of common hydrogen problems, such as brittleness and blistering, likely to be encountered. The standardized procedure used permits the comparison of a number of Cr, Cd, Zn, Cu, Ni, Sn, and Pb plating processes. (L17, Q23, Ni, Pb, Sn, CN, SS)

419-L. Low Cost Finishing With Roto-Finish. C. H. Castle. *Plating*, v. 37, June 1950, p. 615-617, 633.

Fundamental features of Roto-Finish wet tumbling method. Various processes, parts to be finished, equipment, operating variables, precautions, separation of parts, special applications, and limitations. (L10)

420-L. Razor Manufacture: A Boston Industry. *Plating*, v. 37, June 1950, p. 625-629.

Plating at the Gillette Safety Razor Co., using three automatic plating machines: one each for bright Ni, Au, and bright Ni and Au. The base metal throughout is copper or brass. (L17, Au, Ni, Cu)

421-L. Application of Wear Resistant Phosphate Coatings to Ferrous Surfaces. M. B. Roosa. *Lubrication Engineering*, v. 6, June 1950, p. 117-120; discussion, p. 120-121.

Functions, qualities, and method of application and relation to production practices. Material includes automotive, aircraft, and diesel engine parts made of steel and cast iron. (L14, T25, CI, AY)

422-L. Base Metals for Porcelain Enamels. W. A. Deringer. *Ceramic Industry*, v. 54, May 1950, p. 56-59; June 1950, p. 72-75, 116,119.

Compositions, properties, enameling property tests, and production. Effect of welding. Deals with enameling iron, low-carbon steel, or Ti-bearing enameling iron. 14 ref. (L27, CI, CN)

423-L. Electroplating History. *Metal Industry*, v. 76, June 2, 1950, p. 437-438.

Heated solutions, speed of deposition, research work, and proposed formation of Australian Electrodepositors' Society. (L17)

424-L. (Book) Electroplating. A. H. Sanders. 118 pages. 1950. International Textbook Co., Scranton, Pa.

Material is presented from both the practical and scientific viewpoint. Covers basic theory and laws, reversible and standard electrode potentials, electrodeposition of metals, electroplating practice, power supply, and plating for the hobbyist. (L17)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

180-M. A Metallographic Technique for Cemented Carbides. W. H. Bleecker. *Iron Age*, v. 165, May 25, 1950, p. 71-74.

Ordinary polishing abrasives are too soft, hence diamond powder must be used. A suggested nomenclature of carbide phases is advanced. (M21, C)

181-M. Theory of Metals and Alloys. W. Hume-Rothery. *Metal Treatment and Drop Forging*, v. 17, Spring 1950, p. 15-22.

How a theoretical consideration of atomic systems may help to produce alloys with desired properties. Electron theory, its relation to formation of solid solutions, and factors involved in the combination of metal atoms, using Mg alloys as examples. (M25, N12, Mg)

182-M. Distribution of Inclusions in Forged Steel; Relation to Macroscopic and Microscopic Structures. P. Cattier, Ch. Dubois, J. Bleton, and P. Bastien. *Metal Treatment and Drop Forging*, v. 17, Spring 1950, p. 47-52. (Translated from the French.)

Tests were made on a medium-carbon Ni-Cr steel produced in an electric-arc furnace by four different processes. Methods of making, processing, and treatment of steel specimens, and their homogeneity. Micrographs show typical structures. (To be concluded.) (M27, D5, AY)

183-M. The Borides of Manganese. (In English.) Roland Kiessling. *Acta Chemica Scandinavica*, v. 4, No. 1, 1950, p. 146-159.

The binary system Mn-B was investigated by X-ray methods. Four intermediary phases all with metallic properties were found to exist and their structures determined. 16 ref. (M26, M24, Mn, B)

184-M. Investigations on the Binary Systems of Boron With Chromium, Columbium, Nickel, and Thorium, Including a Discussion of the Phase "TiB" in the Titanium-Boron System. (In English.) Lars-Henrik Andersson and Roland Kiessling. *Acta Chemica Scandinavica*, v. 4, No. 1, 1950, p. 160-164.

(M26, M24, B, Cr, Cb, Ni, Th, Ti)

185-M. Metallographic Applications of an Improved Technique for Obtaining Laue Diagrams. (In French.) A. Guinier and R. Le Roux. *Revue de Métallurgie*, v. 47, Mar. 1950, p. 149-157.

Details of technique. Diagrams are compared with micrographs of the same specimens to facilitate interpretation of the diagrams. (M22)

186-M. A New Universal Turn Table for Polished Sections and Its Possible Applications. (In German.) Hans Ehrenberg. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 3, Mar. 1950, p. 65-69.

Device facilitates the study of grain structures of ores and metals, and determination of optical constants of anistropic adsorbed crystals. (M26, M27)

187-M. Physical Investigations of Hard-Metal Alloys. (In German.) Helmut Krainer. *Archiv für das Eisenhüttenwesen*, v. 21, Mar.-Apr. 1950, p. 119-127.

Results of X-ray and magnetic investigation on W, WC, and WC-Co alloys for purposes of production control. The presence of the undesired double carbide $(WCo)_6C$ can be detected by measuring magnetic saturation. The formation of titanium carbide from TiO_2 and C tends to form defective lattices like the oxide from which it is formed. Compares results with those obtained by other authors. 45 ref. (M26, W, C)

188-M. Use of Fractography for Practical Evaluation of Low-Carbon Steel. (In Czech.) Vl. Zednik and Z. Kaderavek. *Hutnické Listy*, v. 5, Feb. 1950, p. 45-51.

Fractographic technique developed by Zapffe and co-workers in the U. S. Shows that various degrees of brittleness of worked ferritic carbon steel can be readily determined by fractography. The discontinuous precipitation of cementite does not appear to be the cause of brittleness. (M23, Q23, CN)

189-M. Application of the Electron Microscope in Metallography. (In Polish.) M. Rozsival, S. Vesely, and J. Chodorowski. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa*, v. 2, No. 1, 1950, p. 81-87.

General principles and description of technique. Comparative electron and light micrographs obtained by the authors. Fields for practical application to metallurgical research. 12 ref. (M21)

190-M. Aluminum Oxide Replicas for Electron Microscopy Produced by a Two-Step Process. G. Hass and M. E. McFarland. *Journal of Applied Physics*, v. 21, May 1950, p. 435-436.

Method for preparing Al_2O_3 replicas of Al and other specimens. A thick layer of Al is evaporated onto the surface to be studied and pulled off the surface with Scotch Tape or cement-covered glass. Al_2O_3 is formed on the side of the Al film which has been in contact with the specimen by anodizing in 3% ammonium tartrate at about 40 volts. The film is released from its substrate in dilute HCl washed with distilled water, and mounted for electron-microscope investigation. Applicability is demonstrated with electron micrographs of various specimens. Films of 100-150A in thickness can be prepared. (M21)

191-M. Single Crystal X-Ray Techniques for Use With Alloys Requiring Protective Atmospheres. Joseph Singer and F. H. Ellinger. *Journal of Applied Physics*, v. 21, May 1950, p. 467-468.

For obtaining X-ray diffraction data. (M22)

192-M. Fundamentals of the Working of Metals. Part XI. General Relations Between Grain Structure and Properties of Hotworked, Coldworked and Annealed Metals. George Sachs. *Modern Industrial Press*, v. 12, May 1950, p. 6, 8, 16, 36.

(M27, Q general)

193-M. Report of Committee E-4 on Metallography. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 513-516.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 74, 1949. (M general)

194-M. Overheating and Burning; Detection in Steel Specimens by Microscopical Methods. A. Preece and J. Nutting. *Iron and Steel*, v. 23, May 11, 1950, p. 205-207; discussion, p. 262-264.

Previously abstracted for *Journal of the Iron and Steel Institute*. See item 41-M, 1950. (M 21, ST)

195-M. The Constitution of Magnesium-Rich Alloys of Magnesium and Zirconium. G. A. Mellor. *Journal of the Institute of Metals*, v. 77, Apr. 1950, p. 163-174.

An investigation of alloys containing up to 0.7% Zr. 12 ref. (M24, Mg)

196-M. Twin Relationships in Ingots of Germanium. W. C. Ellis. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, June 1950, p. 886.

Orientations of regions were determined by Laue X-ray back-reflection methods and plotted on stereograms. Results appear to be important in the general theory of solidification. (M27, N12, Ge)

197-M. Metallographic Re-Evaluation of the Indium-Zinc Eutectic Composition. S. C. Carapella, Jr. and E. A. Peretti. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, June 1950, p. 890-891.

Composition of the eutectic point. (M24, In)

198-M. The Electron Microscope in Metallurgy. Alfred L. Ellis. *Blast Furnace and Steel Plant,* v. 38, June 1950, p. 681-686.

Previously abstracted from *American Iron and Steel Institute,* Preprint, 1950. See item 168-M, 1950. (M21, CN, AY)

199-M. The Electron Diffraction Camera. Oliver Row. *Trend in Engineering at the University of Washington,* v. 2, July 1950, p. 21-23.

Camera incorporated in the R.C.A. electron microscope to permit operation to be shifted from one application to the other in a matter of minutes. Use to study transmission and reflection patterns. (M22)

200-M. The Borides of Some Transition Elements. (In English.) Roland Diessling. *Acta Chemica Scandinavica,* v. 4, No. 2, 1950, p. 209-227.

A comprehensive discussion of the structural work on the borides, including tables of axial lengths and interatomic distances. Structures are discussed with respect to the arrangement of boron atoms. 34 ref. (M26, B)

201-M. A Lithium Tungsten Bronze of Perovskite Type. (In English.) Arne Magneli and Robert Nilsson. *Acta Chemica Scandinavica,* v. 4, No. 2, 1950, p. 398.

Preparation and testing by means of X-ray photographs and microscopic examination. (M21, Cu)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

128-N. Transformation of 8630 Steel; Continuous Cooling and Isothermal Transformation Correlated With End Quench Hardenability Specimen. R. A. Grange, J. F. Boyce, and V. G. Peck. *Metal Progress,* v. 57, May 1950, p. 636B.

A time-temperature phase diagram with typical phases shown by photomicrographs. (N8, AY)

129-N. The Transformation of Austenite in 8630 Steel. R. A. Grange, J. F. Boyce, and V. G. Peck. *Metal Progress,* v. 57, May 1950, p. 637-642.

Transformation characteristics and microstructure of 8630 low-alloy steel. Isothermal and continuous cooling diagrams, hardness and microstructural variations along the end-quenched hardenability bar, data on the martensite range, and optical and electron micrographs. (N8, AY)

130-N. A Note on the Formation and Structure of Iron Dendrites in a Magnesium Alloy. Harry C. Burnett, Jr., and Herbert C. Vacher. *Journal of Research of the National Bureau of Standards,* v. 44, Apr. 1950, p. 443-446.

Metallographic examination of commercially pure Mg that had been heated to 1000° C. in an iron crucible revealed iron dendrites. Further examination by the microradiographic method showed that the dendrites grew at uniform rates in the dodecahedral directions. (N12, Mg)

131-N. Influence of Impurities on the Recrystallization of High-Purity Aluminum. (In French.) H. Chossat. *Revue de Métallurgie,* v. 47, Mar. 1950, p. 167-182.

Shows that the course of Al recrystallization is markedly influenced by traces of impurities; the difference of recrystallization temperatures of 99.998 and 99.99% Al may be as much as 150° C. However, a larger impurity content (0.7-1%) influences this temperature to a much lesser extent, the difference being a maximum of 30° C. (To be continued.) (N5, Al)

132-N. Order-Disorder. (In German.) B. Kockel. *Annalen der Physik,* ser. 6, v. 7, Nos. 1-2, 1950, p. 18-32.

Fundamental theoretical analysis shows that it is impossible to explain the observed behavior on the theory that only adjoining atom pairs contribute to orientation energy. This theory helps, however, to explain Weiss' theory of ferromagnetism. 12 ref. (N10)

133-N. The Orientation Dependence of the Rate of Grain Boundary Migration. Paul A. Beck, Philip R. Sperry, and Hsun Hu. *Journal of Applied Physics,* v. 21, May 1950, p. 420-425.

Very small recrystallized grains of a large variety of orientations were produced locally in lightly rolled high-purity Al crystals. Rate of growth of these small grains varied greatly, depending on their relative orientation with respect to the matrix crystal. Results indicate that recrystallization textures developing in the spontaneous recrystallization of deformed single crystals can be accounted for by the orientation dependence of rate of growth. 20 ref. (N5, Al)

134-N. Diffusional Viscosity of a Polycrystalline Solid. Conyers Herring. *Journal of Applied Physics,* v. 21, May 1950, p. 437-445.

According to a suggestion of Nabarro, any crystal can change its shape by self-diffusion in such way as to yield to an applied shearing stress, and this can cause the macroscopic behavior of a polycrystalline solid to be like that of a viscous fluid. It is possible that this phenomenon is the predominant cause of creep at very high temperatures and very low stresses, though not under more usual conditions. The theory is developed quantitatively, and calculations of rate of creep, or of effective viscosity, are given for aggregates of quasi-spherical grains and for wires composed of cylindrical grains. 22 ref. (N1, Q3)

135-N. Synthesis of Cementite. L. J. E. Hofer and E. M. Cohn. *Journal of Chemical Physics,* v. 18, May 1950, p. 766-767.

Known methods of synthesis suffer from the disadvantages that the product is formed in poor yield, is contaminated with free carbon, or is highly sintered. New method that overcomes these difficulties. (N8, Fe)

136-N. Isothermal Rate of Solidification of Small Droplets of Mercury and Tin. D. Turnbull. *Journal of Chemical Physics,* v. 18, May 1950, p. 768-769.

(N12, Hg, Sn)

137-N. Correlation of Liquid-Solid Interfacial Energies Calculated From Supercooling of Small Droplets. D. Turnbull. *Journal of Chemical Physics,* v. 18, May 1950, p. 769.

Data applicable to Hg, Ga, Sn, Bi, Pb, Sb, Ge, Ag, Au, Cu, Mn, Ni, Co, Fe, Pd, and Pt. Data are correlated mathematically. (N12, P10)

138-N. Overheating and Burning. Part III. The Influence of Excessive Reheating Temperatures on the Mechanical Properties and the Structure of Alloy Steels. A. Preece and A. Hartley. *Iron and Steel,* v. 23, May 11, 1950, p. 201-205; discussion, p. 262-264.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 32-N, 1950. (N8, Q general, AY)

139-N. Severely Heated Steel Grain-Boundary Phenomena. T. Ko and D. Hanson. *Iron and Steel,* v. 23, May 11, 1950, p. 208-215; discussion, p. 262-264.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 33-N, 1950. (N8, CN)

140-N. Overheating; A Note on the Influence of Sulphur Content and Mn/S Ratio. E. C. Rollason and D. F. T. Roberts. *Iron and Steel,* v. 23, May 11, 1950, p. 215-216; discussion, p. 262-264.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 101-N, 1950. (N12, ST)

141-N. Mild Steel; Extension of the Ar_1 Range With Carbide Formation Due to High-Temperature Treatment. J. H. Whiteley. *Iron and Steel,* v. 23, May 11, 1950, p. 217-219; discussion, p. 264-266.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 100-N, 1950. (N8, CN)

142-N. The Calculation of the Activation Energies of Recovery and Recrystallization From Hardness Measurements on Copper. N. Thorley. *Journal of the Institute of Metals,* v. 77, Apr. 1950, p. 141-161.

Changes which take place in the crystallites of a metal when it is cold worked and then annealed are reviewed, and suggestions are made for observing these changes directly, using X-ray line-broadening measurements, in an investigation of the fundamental processes of annealing. Cook and Richards's two-stage theory of recrystallization for an isothermal anneal is extended, and a new equation obtained which fits their experimental results for hardness of copper better than previous equations. A direct method is developed by which activation energies of both recovery and recrystallization processes are obtained separately. 12 ref. (N5, Cu)

143-N. The Penetration of Hydrogen Into Steel. (In German.) Theo Bruggemann. *Chemische Technik,* v. 1, Dec. 1949, p. 178-182.

Mechanism by which hydrogen penetrates the steel and means of preventing this undesirable effect were investigated. Injurious effects of H_2 on properties of steel. 36 ref. (N1, ST)

144-N. Nitriding of Iron. (In Russian.) I. R. Krichevskii and N. E. Khaganova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 71, Mar. 21, 1950, p. 481-484.

It has been shown that γ-phase is incompletely formed during nitriding of iron by molecular N_2 at high pressures. Rate of formation of this

phase during nitriding with an NH_3-H_2 mixture at atmospheric pressure was studied to help explain this fact. 12 ref. (N8, J28, Fe)

145-N. Activation Energy for Recrystallization in Rolled Copper. B. F. Decker and D. Harker. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, June 1950, p. 887-890.

Recrystallization in oxygen-free high-conductivity Cu and spectroscopically pure Cu was followed by X-ray diffraction determinations of the amount of material with the cold worked and recrystallized textures in specimens which had been given various heat treatments. (N5, P13, Cu)

146-N. Order in Metallic Crystals. R. Smoluchowski. *Physics Today,* v. 3, June 1950, p. 16-19.

Recent results obtained in the study of binary alloys in which a change in the distribution of the two kinds of atoms takes place. These transformations are usually referred to as order-disorder phenomena. (N10)

147-N. Effect of Beryllium on D.T.D. 300; Result of Additions on Grain Size and Tensile Properties. A. L. Mincher. *Metal Industry,* v. 76, June 2, 1950, p. 435-436.

Possible effects of Be added to Al alloy (10% Mg) to prevent reaction with moisture in sand molds. Tensile properties are greatly influenced by changes in grain size. Results show that Be additions do not cause grain coarsening. (N3, Q general, Al, Be)

P

PHYSICAL PROPERTIES AND TEST METHODS

163-P. The Oxidation of Beryllium at High Temperatures. Daniel Cubicciotti. *Journal of the American Chemical Society,* v. 72, May 1950, p. 2084-2086.

Rate of reaction between Be and O_2 was studied from 840 to 970° C. The oxidation was found to proceed according to the parabolic law with much smaller rate constants than for other similar reactions. Energy of activation was found to be 62 kcal. per mol. 13 ref. (P13, R2, Be)

164-P. High-Temperature Heat Contents of Some Zirconium-Containing Substances. J. P. Coughlin and E. G. King. *Journal of the American Chemical Society,* v. 72, May 1950, p. 2262-2265.

Measurements of zirconium metal, of the oxide ZrO_2, nitride ZrN, silicate $ZrSiO_4$, and chloride $ZrCl_4$. (P12, Zr)

165-P. The New Metals—Molybdenum, Titanium and Zirconium. *Petroleum Refiner,* v. 29, May 1950, p. 138.

Melting points, densities, thermal expansion coefficients, thermal conductivities, specific heats, and tension moduli of Mo, Ti and Zr, compared with common ferrous and nonferrous metals and alloys. (P10, P11, P12, Q27, Mo, Ti, Zr)

166-P. Factors Affecting Magnetic Quality. R. M. Bozorth. *Bell System Technical Journal,* v. 29, Apr. 1950, p. 251-286. Based on Chapter II of "Ferromagnetism", to be published in early 1951 by Van Nostrand.

Detailed description as applied to various metallic and nonmetallic materials. (P16)

167-P. The Influence of Pressure on the Curie Point. (In English.) A. Michels and S. R. De Groot. *Physica,* v. 16, Mar. 1950, p. 249-252.

Critically discusses a paper on the above published by Ebert and Kussmann (1938) which indicated independence of Curie point on pressure. Shows that data of the above authors was not sufficiently accurate to justify their conclusions; and that, on a thermodynamic basis, there must be a pressure effect. (P16)

168-P. The Electrical Conductivity of Binary Alloys. (In German.) G. Grube. *Zeitschrift für Elektrochemie und angewandte physikalische Chemie,* v. 54, Mar. 1950, p. 99-107.

Lecture consists of a correlated review of the literature. Graphs show conductivity isotherms, constitution diagrams, and temperature-resistance curves of various nonferrous binary alloys and of several pure nonferrous metals. 28 ref. (P15, M24, Eg-a)

169-P. Electrical and Thermal Conductivity of Bismuth Monocrystals in a Transverse Magnetic Field. (In German.) E. Grüneisen, K. Rausch, and K. Weiss. *Annalen der Physik,* ser. 6, v. 7, Nos. 1-2, 1950, p. 1-17.

Results of this study agree essentially with those of Stierstadt. Change of resistance upon reversal of magnetic field was shown to be dependent on external test conditions. The magnetic field had much less effect on thermal resistance than on electrical resistance. 13 ref. (P16, Bi)

170-P. Influence of Small Cavities on the Velocity of Sound in Metals. (In Italian.) F. Gatto. *Alluminio,* v. 19, No. 1, 1950, p. 19-26.

A variety of metals and alloys was studied, using specimens with small holes drilled in them. Relative variation is related to density, but otherwise unrelated to the metal composition. Equation is derived for sound velocity in cylindrical specimens having a transverse hole of given size and position. (P10)

171-P. The Effect of Compressive Stresses on the Linear Thermal Expansion of Magnesium and Steel. Joseph L. Rosenholtz and Dudley T. Smith. *Journal of Applied Physics,* v. 21, May 1950, p. 396-399.

A series of cylinders of annealed, extruded, pure Mg and medium soft steel were subjected to a sequence of compressive stresses at room temperature and their respective coefficients of linear thermal expansion in the direction of stress application determined from 20 to 100° C. The cylinders were then heat treated to permit either recovery or recrystallization and changes in length measured. Coefficient of linear thermal expansion and length changes are plotted as a function of true compressive stress for each metal. These properties may be used to determine the stress history of a test specimen for which characteristic curves are available. (P11, Mg, CN)

172-P. Surface Tension Effects in Oriented Thin Silver Films. G. W. Johnson. *Journal of Applied Physics,* v. 21, May 1950, p. 449-453.

Structural changes of thin oriented films of Ag produced by vacuum condensation on cleaved surfaces of single crystals of rock salt were followed as a function of temperature. Effects observed are attributed to readjustment of the oriented surface under the influence of surface-tension forces. 13 ref. (P10, N15, Ag)

173-P. The Surface Tension of Liquid Metals and the Excess Binding Energy of Surface Atoms. R. A. Oriani. *Journal of Chemical Physics,* v. 18, May 1950, p. 575-578.

By assuming that the cohesive energy of a liquid metal can be expressed as the sum of the pairwise interaction energies of nearest neighbors, for atoms on the surface and in the interior from simple considerations, it is shown that the pairwise bonding energy of surface atoms is greater than that for atoms in the interior of liquid metals. With mercury as the sole exception, this excess bonding energy is a nearly constant 2% of the cohesive energy when the liquids are taken as close-packed; but greater variation of this proportion is obtained when the liquids are taken as solid-like structure. 14 ref. (P10)

174-P. Contributions to the Data on Theoretical Metallurgy. XI. Entropies of Inorganic Substances. Revision (1948) of Data and Methods of Calculation. K. K. Kelley. *U. S. Bureau of Mines,* Bulletin 477, 1950, 147 pages.

517 references. (P12)

175-P. Summarized Proceedings of Symposium on Applications of Ultrasonics. G. Bradfield. *Proceedings of the Physical Society,* v. 63, sec. B, May 1, 1950, p. 305-322.

Symposium of the Acoustics Group of the Physical Society, held Feb. 18, 1949, which surveyed recent advances in investigation of the fundamental structure of matter. Available sources of ultrasonic power and the importance of barium titanate as a powerful and strongly coupled piezoelectric transducer. Importance of the study of cavitation. Use of ultrasonics for soldering aluminum, and refining the crystalline structure in solidification of light alloys. 32 ref. (P10, K7, E25, Al)

176-P. Surface Tensions in the System Solid Copper-Molten Lead. G. L. J. Bailey and H. C. Watkins. *Proceedings of the Physical Society,* v. 63, sec. B, May 1, 1950, p. 350-358.

Method by which surface tensions in the systems Cu-H_2 or Cu-A and Cu-Pb-H_2 or Cu-Pb-A are determined. When lead vapor is present in the atmosphere at a partial pressure of 0.1 mm. Hg, surface tension of the Cu-gas surface has a much lower value. It is suggested that the reduction is due to adsorption of Pb at the Cu-gas surface. Failure of the liquid phase to exhibit a contact angle of zero against solid Cu surfaces is thereby understood. 10 ref. (P10, Cu, Pb)

177-P. Reports of Committee A-6 on Magnetic Properties. *American Society for Testing Materials, Proceedings,* v. 49, 1949, p. 128-130.

Previously abstracted from *American Society for Testing Materials,* Preprint No. 4. See item 9-165, 1949. (P16)

178-P. Magnetism in Copper Alloys: The Effect of Iron as Impurity. Allison Butts and Paul L. Reiber, Jr. *American Society for Testing Materials, Proceedings,* v. 49, 1949, p. 857-883; discussion, p. 884-886.

Previously abstracted from *American Society for Testing Materials,* Preprint No. 34. See item 3C-111, 1949. (P16, Cu)

179-P. Introduction of the Concept of Intermittent Activation of the Electronic State of Ferromagnetics. (In French.) Robert Forrer. *Comptes Rendus* (France), v. 230, Mar. 27, 1950, p. 1254-1255.

The above concept is proposed on the basis of theoretical considerations. Curie points may readily be

calculated with aid of this concept. (P16)

180-P. Concerning Anomalies of the Specific Heat of Germanium and Hafnium at Low Temperatures. (In French.) Pierre Aigrain and Claude Dugas. *Comptes Rendus* (France), v. 230, Mar. 27, 1950, p. 1277-1278.

Investigated between 10 and 200° K. Deviation of the value of specific heat from that calculated according to the formula of Debye was determined. Possible causes are indicated. (P12, Ge, Hf)

181-P. Concerning the Structure of Adsorption Films Formed by Mineral Substances. (In French.) Paul Kozakevitch. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 47, Jan.-Feb. 1950, p. 24-32.

Various surface-active metallic and oxide systems were investigated: namely, amalgams of Li, Na, K, Rb, Cs, and Ba; Na in Sn; Sb and Sn in Cu; H_2O in $AgTl(NO_3)_2$; Na_2O and P_2O_5 in FeO; and Cr_2O_3 in $Na_2Si_2O_5$. Attempts to apply Rideal's equation were successful only in certain cases. General rules for the structure of saturated films. 20 ref. (P13)

182-P. The Adsorption of Hydrogen by Tungsten, and the Mechanism of the Parahydrogen Conversion at Tungsten Surfaces. (In English.) E. K. Rideal and B. M. W. Trapnell. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 47, Jan.-Feb. 1950, p. 126-138; discussion, p. 138.

Experimental apparatus and procedure and results obtained. Preliminary work on H_2 adsorption by evaporated Ni films has yielded results qualitatively similar to those obtained with tungsten. Evaporated carbon films have also been prepared. 21 ref. (P13, W)

183-P. Thermodynamic Relationships in Chlorine Metallurgy. Herbert H. Kellogg. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, June 1950, p. 862-872.

Equations representing the standard free energy of formation as a function of temperature, for thirty metallic chlorides, are presented and plotted on a free-energy vs. temperature diagram. Use of these data for calculations on reduction of metallic chlorides, refining of metals with chlorine, and chlorination of metallic oxides and sulphides. 37 ref. (P12, C general)

184-P. Superconductivity of Lead. H. A. Boorse, D. B. Cook and M. W. Zemansky. *Physical Review,* ser 2, v. 78, June 1, 1950, p. 635-636.

Results of the determination of zero-field transition temperatures of Pb by a.c. induction method. (P15, Pb)

185-P. Damping Cacapity. Part I. Introduction and Technique of Measurement. Edward Linacre. *Iron and Steel,* v. 23, May 1950, p. 153-156.

Review of the literature; methods of measurement, and results obtained by alteration of any of the factors involved in method of measurement or condition of the specimen are described. Theories (notably by Zener), and correlation of damping capacity with other physical properties. 64 ref. (To be continued.) (Q8)

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Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

352-Q. Mechanical Testing, Experimental Stress Analysis and Apparatus in Pressure Vessel Research. F. G. Tatnall. *American Society of Mechanical Engineers,* Paper No. 49-A-68, 1949, 11 pages.

Reviews the above for interpretation of test data leading to design improvement and safety in structures. (Q25)

353-Q. Strong Ductile Alloy Steel Permits Weight Saving in Structural Parts. D. A. Shinn. *Materials & Methods,* v. 31, May 1950, p. 70-72.

Impact properties at high strength levels of Hy-Tuf, a relatively new Ni-Cr-Mo steel, which compare favorably with those of SAE 4340. Suggests its use for such critical applications as aircraft structures. (Q6, T24, AY)

354-Q. Properties of Metals at Elevated Temperatures. G. V. Smith. *Combustion,* v. 21, Apr. 1950, p. 65-67; May 1950, p. 51-53.

Part I: Metal strength at elevated temperatures, working stresses that may be applied, characteristics of creep, and the relation between stress and time for rupture. A typical design chart for a stainless steel. Part II: Effects of non-constant stress and temperature, metallurgical variables, microstructural and surface changes, and scaling and corrosion. (Q3, Q4, M27, R2, SG-h)

355-Q. Plastic Collapse and Shakedown Theorems for Structures of Strain-Hardening Material. B. G. Neal. *Journal of the Aeronautical Sciences,* v. 17, May 1950, p. 297-306.

Some theorems concerning collapse and shakedown are established for trusses and framed structures whose members possess strain-hardening properties. The most interesting cases, covered by the theorems, are those in which strain hardening is limited, so that the stress-strain characteristic eventually becomes horizontal and plastic deformation can continue indefinitely under constant stress. 19 ref. (Q28)

356-Q. Anomalous Internal Friction Associated With the Precipitation of Copper in Cold-Worked Al-Cu Alloys. T'ing-Sui Ke. *Physical Review,* ser. 2, v. 78, May 15, 1950, p. 420-423.

Anomalous internal friction at very small stress levels was observed in cold-worked aluminum containing 0.5% Cu. This friction, which was not observed in high-purity Al after similar treatment, can be eliminated by annealing at high temperatures so that the specimen completely recrystallizes. This anomalous behavior is shown to be associated with an early stage "precipitation" of Cu from the solid solution with Al. Observed phenomena are consistent with the concept that atmospheres of foreign atoms are formed around the dislocations created in the specimen by cold working. 14 ref. (Q22, N5, Al)

357-Q. A New Criterion for the Occurrence of Slip in Thin Single Crystals. T. L. Wu and R. Smoluchowski. *Physical Review,* ser. 2, v. 78, May 15, 1950, p. 468-469.

It was found that in thin crystals of Al, slip does not occur in the plane or direction which corresponds to the maximum resolved shear. Instead, slip directions are favored which correspond to a short path of slip across the crystal. A formula is derived which permits one to predict the behavior of thin single crystals in tension. (Q25, Al)

358-Q. Influence of Interfacial Potential on Friction and Surface Damage. F. P. Bowden and L. Young. *Research,* v. 3, May 1950, p. 235-237.

Experimental study applied to inert metals, such as Pt, immersed in an electrolyte, shows that small changes in interfacial potential have a profound effect, both on friction and on the surface deformation. Results are explained in terms of the electrodeposition and electrosolution of absorbed gas layers, and also of electrical interaction of the charged double layer. 12 ref. (Q9, P15, EG-d)

359-Q. Fatigue Properties of Four Cast Aluminum Alloys at Elevated Temperatures. J. McKeown, D. E. Dineen, and L. H. Back. *Metallurgia,* v. 41, May 1950, p. 393-396. (Q7, Al)

360-Q. Measurement of Stresses in Bicycle Frames Under Normal Operating Conditions. (In French.) Francois Flusin. *Revue de l'Aluminium,* v. 27, Mar. 1950, p. 89-95.

Stresses at certain points of an Al alloy bicycle frame were measured under a static load of 198 lb. Maximum fatigue was recorded in the fork. Dynamic measurements made either on the testing stand or on the road show that corresponding overloads can be in the neighborhood of 100% of the static values. Concludes that a greater reduction of weight is still possible. (Q25, Al)

361-Q. Contribution to the Study of Influence of Microstructure on the Heat Resistance of Steel. (In French.) Georges Delbart and Michel Ravery. *Revue de Metallurgie,* v. 47, Mar. 1950, p. 215-233; discussion, p. 233-234.

Investigated for a low-alloy Cr-Mo steel produced in a basic electric furnace. Creep properties were determined at 450, 525, 550, and 575° C. under loads of 7, 11, 15, and 24 kg. per sq. mm. in shortened long-time tests. Influence of heat treatment on creep properties. Microstructures corresponding to the various treatments are illustrated. 14 ref. (Q3, M27, AY)

362-Q. Embrittlement of High-Phosphorus Steels Upon Annealing. (In

German). Eduard Houdremont and Hans Schrader. *Archiv für das Eisenhüttenwesen,* v. 21, Mar.-Apr. 1950, p. 97-104.

Previously abstracted from Swedish version in *Jernkontorets Annaler.* See item 115-Q, 1950. (Q23, J23, ST)

363-Q. Creep of Steel Under Static Stresses at Room Temperature. (In German.) Walter Jäniche and Gunther Thiel. *Archiv für das Eisenhüttenwesen,* v. 21, Mar.-Apr. 1950, p. 105-118.

Creep behavior of six carbon and low-alloy steels at room temperature and effects of heat-treatment and cold working when stressed below the yield point up to several hundred hours were studied. 34 ref. (Q3, CN, AY)

364-Q. Elongation and Stress Measurements on Thin Resistance Wires (Extensometer Strips). (In German.) Kurt Fink. *Archiv für das Eisenhüttenwesen,* v. 21, Mar.-Apr. 1950, p. 129-135.

Experiments which show the extent to which tensile stress alters the electrical resistance of wires made of "Chrome-Nickel B" (18% Cr, 60% Ni, 18.5% Fe, 3% Mn, and 0.5% Si), "CN" (20% Cr, 79% Ni), and Constantan (55% Cu, 43.5% Ni, 1.5% Mn). Measurements made for elongations of less than 0.5 up to 5% show that resistance change is a linear function of elongation. The measurements were extended to tensile, compression, bending and torsional stresses. 11 ref. (Q23, P15, Ni, Cu)

365-Q. A Dynamic Calibration of Extensometer Strips. (In German.) *Archiv für das Eisenhüttenwesen,* v. 21, Mar.-Apr. 1950, p. 137-142.

Using an extensometer strip, a tube amplifier, and a cathode-ray oscillograph, impulse waves produced by one steel bar dropping on another were recorded photographically. Close agreement between the measured and the calculated impulse wave shows that extensometer strips can be used to record dynamic stresses. 14 ref. (Q25)

366-Q. Relaxation at High Temperatures. (In Czech.) Alexander A. Chit'kov. *Hutnické Listy,* v. 5, Feb. 1950, p. 52-56.

Two theories have been proposed for correlation of relaxation and creep data (the time-hardening and the strain-hardening theories). Experimental data show that neither theory correctly represents the above relationship because relaxation differs from creep in connection with both the mechanism of plastic deformation and the nature of internal "micro-mechanical" processes. Indicates that stress relaxation must be investigated independently of creep. 17 ref. (Q3)

367-Q. Microhardness of Carbon Steels. (In Polish.) W. Loskiewicz, W. Haczewski, and Z. Wojcik. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa,* v. 2, no. 1, 1950, p. 37-47.

The relation between results of hardness measurements obtained by use of micro and macro methods was investigated. Six carbon steels of various compositions were quenched and tested at different stages of isothermal transformation of austenite. The tests confirmed the fact that in the transition range from bainite to pearlite local decrease of microhardness occurs. 18 ref. (Q29, N8, CN)

368-Q. Internal Friction of Metals at Very High Temperatures. T'ing-Sui Ke. *Journal of Applied Physics,* v. 21, May 1950, p. 414-419.

In connection with study of internal friction peak (vs. temperature) associated with viscous behavior of grain boundaries in metals, some other effects were observed at higher temperatures causing additional internal friction in superposition with the high-temperature branch of this internal friction peak. This additional internal friction was found to have its origins in some effects of cold working introduced into the interior of the grains which remains even after complete recrystallization. This friction was found to be very high in aged specimen of high-purity Al. Observations are consistent with the viewpoint that this internal friction is caused by the presence of dislocations in the interior of the specimen. 14 ref. (Q22)

369-Q. Fatigue Characteristics of Aircraft Materials and Fastenings. T. E. Piper, K. F. Finlay, and A. P. Binsacca. *ASTM Bulletin,* May 1950, p. 60-64; discussion, p. 64.

Abstracts from numerous papers on the subject, in addition to the authors' experience indicate that methods of evaluation of fatigue characteristics of aircraft materials and fastenings must undergo drastic revision. Conventional testing procedures do not supply data significant to sever conditions of dynamic loading found in aircraft of modern design. Recommends establishment of significant criteria upon which realistic design can be based on extensive tests involving interrupted dynamic test procedures. Data presented are for spot welded and riveted Alclad and Al alloy sheets. 12 ref. (Q7, Al)

370-Q. The Why and How of Cold Hardness Measurement. John H. Hruska. *Iron Age,* v. 165, June 1, 1950, p. 77-80.

Special auxiliary equipment for use with standard testing machines, for determining hardness at below-zero temperatures. Data for various steels, and for commercial and very pure metals are tabulated. (Q29)

371-Q. Relative Wear Rates of Various Diameter Grinding Balls in Production Mills. D. E. Norquist and J. E. Moeller. *Mining Engineering,* v. 187, June 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 187, 1950, p. 712-714; discussion, p. 714.

Results of wear on marked balls, 4, 3½, 3, and 2 in. diam. All balls were forged alloy steel of practically the same chemical analysis and hardness. Results indicate that balls in a given mill for a given length of time will have equal diameter losses, regardless of size. (Q9, B13, AY)

372-Q. A High-Temperature Extensometer. W. W. Eitel and J. H. Potter. *Instruments,* v. 23, May 1950, p. 448-449.

Instrument designed for measuring bolt stresses in high-pressure, high-temperature flanged pipe joints at the time of assembly and under operating conditions. (Q27)

373-Q. Comparing Fundamentals of Spring Suspensions. *Vancoram Review,* v. 6, no. 3, 1950, p. 3-5, 20-21. Based on paper by N. E. Hendrickson.

Efficiency of various types of springs was studied by comparing the "energy storage" each could provide. The fundamental principles are applicable to all springs, whether made of steel or nonferrous metals. Formulas for calculating the theoretical weight of spring steel required in each type for a given load, deflection, and stress. (Q28, T7, ST)

374-Q. Mechanical Testing and Properties of Gray Iron. C. K. Donoho. *Foundry,* v. 78, June 1950, p. 96-99, 218-219.

Common mechanical tests for cast iron, including nodular iron. Some new test data on section size effect. (Q general, CI)

375-Q. Structural Properties of Magnesium. *Magazine of Magnesium,* May 1950, p. 8-11.

Comparative data on various mechanical and physical properties are tabulated and discussed. (Q general, P general, Mg)

376-Q. Stresses in "Head-to-Shell" Juncture of Pressure Vessels. R. G. Sturm, H. L. O'Brien, E. Wetterstrom, and J. Evans. *Welding Journal,* v. 29, June 1950, p. 285s-292s.

Resume of literature theories in the design of pressure vessel head, application of these theories, tests of stress distribution under pressure, and correlation of test results with theory. (Q25, T26, CN)

377-Q. Weld Metal Properties at Low Temperatures. T. N. Armstrong and W. L. Warner. *Welding Journal,* v. 29, June 1950, p. 295s-302s.

Tests of deposited metal of ferritic nickel steel electrodes containing up to 5% nickel, 25-20 stainless steel, monel, and a high Ni-Cr-Fe alloy containing Cb. Mechanical properties are tabulated, plotted, and discussed. (Q general, K general, AY, ST, Ni)

378-Q. Brittle Failure and Size Effect in a Mild Steel. K. J. Stodden and E. P. Klier. *Welding Journal,* v. 29, June 1950, p. 303s-310s.

Under certain experimental conditions the phenomenon of size effect can be sensibly eliminated as it pertains to the appearance of brittle failure. Specimen sizes ranged from the 10x10-mm. Charpy bar to a 1¼x1¼-in. bar tested in slow bending. For these sizes the transition temperature was invariant. 18 ref. (Q6, CN)

379-Q. What Roller Bearings Mean to Diesel-Electric Locomotives. F. S. Ball. *Railway Age,* v. 128, June 10, 1950, p. 68-70.

Control of fatigue effect, theory of metal failure, and bearing design. (Q7, S21, T7, T23)

380-Q. Stress-Strain and Elongation Graphs for Alclad Aluminum Alloy 24S-T86 Sheet. James A. Miller. *National Advisory Committee for Aeronautics,* Technical Note 2094, May 1950, 31 pages.

Results of tests on duplicate longitudinal and transverse specimens with nominal thicknesses of 0.032, 0.064, and 0.125 in. are plotted. Tensile and compressive stress-strain and stress-deviation to a strain of about 1% are presented on dimensionless graphs. Stress-strain graphs and graphs of local elongation and of elongation against gage length are included for tensile specimens tested to fracture. 11 ref. (Q27, Al)

381-Q. Fracture and Strength of Solids. E. Orowan. *Reports on Progress in Physics,* v. 12, 1949, p. 185-232.

The main types of fracture and the corresponding fracture mechanism. Ultimate stress and necking, brittle fracture, ductile fractures and notch brittleness, fatigue, intercrystalline fractures, fracture by molecular sliding, etc. 94 ref. (Q26)

382-Q. Report of Committee A-3 on Cast Iron. *American Society for Testing Materials, Proceedings,* v. 49, 1949, p. 97-109.

Includes report of Subcommittee XV on impact testing and proposed methods for impact testing of cast iron. (Q6, CI)

383-Q. Report of Joint Committee on Effect of Temperature on the Properties of Metals. *American So-*

ciety for Testing Materials, Proceedings, v. 49, 1949, p. 241-255.

Includes brief appendices as follows: "Effect of Variables on the Creep Resistance of Steels" (H. C. Cross); "Stability of Steels as Affected by Temperature" (J. J. Kanter); and "High-Temperature and Low-Temperature Testing Equipment in the United States" (results of a questionnaire). (Q3)

384-Q. Residual Stresses in Metals. William Marsh Baldwin, Jr. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 539-583.

23rd Edgar Marburg Lecture. Comprehensive description of the present state of knowledge concerning residual stresses, showing the progress made since E. Heyn's lecture before the British Institute of Metals in 1914. 64 ref. (Q25)

385-Q. Effect of Manufacturing Practice on Creep and Creep-Rupture Strength of Low-Carbon Steel. G. V. Smith and E. J. Dulis. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 584-599; discussion, p. 600-601.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 18. See item 3B-119, 1949. (Q3, CN)

386-Q. The Effects of Temperature and Material Structure on the Fracture Properties of Medium-Carbon Steel. Julius Miklowitz. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 602-617.

Effects of variations in temperature of testing, size of grain, and type of pearlite in the structures of a Si-killed and Si-Al-killed steel on ductility and strength were determined. Apparatus and test results. Micrographs show structures resulting from various thermal treatments. (Q26, M27, CN)

387-Q. The Influence of Conditions of Heat Treatment and Hot-Cold Work on the Properties of Low-Carbon N-155 Alloy at Room Temperature and 1200° F. J. W. Freeman, E. E. Reynolds, D. N. Frey, and A. E. White. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 618-645.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 21. See item 3B-130, 1949. (Q general, Co, SG-h)

388-Q. The Influence of Fluctuations in Stress Amplitude on the Fatigue of Metals. T. J. Dolan, F. E. Richart, Jr. and C. E. Work. *American Society for Testing Materials Proceedings*, v. 49, 1949, p. 646-679; discussion, p. 680-682.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 32. See item 3A-137, 1949. (Q7, ST, Al)

389-Q. The Effects of Metallizing Procedures on the Fatigue Properties of Steel. W. Lee Williams. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 683-700; discussion, p. 701.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 20. See item 7B-107, 1949. (Q7, L10, G23, ST)

390-Q. A New High-Speed Sheet Metal Fatigue Testing Machine for Unsymmetrical Bending Studies. G. R. Gohn and E. R. Morton. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 702-713; discussion, p. 714-716.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 31. See item 9-166, 1949. (Q7)

391-Q. The Time Delay for the Initiation of Plastic Deformation at Rapidly Applied Constant Stress. D. S. Clark and D. S. Wood. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 717-735; discussion, p. 736-737.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 25. See item 9-177, 1949. (Q2/, CN)

392-Q. Elastic and Fracture Toughness Studies of a Stainless Steel. Carl W. Muhlenbruch. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 738-753; discussion, p. 754-756.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 24. See item 3B-144, 1949. (Q21, Q26, SS)

393-Q. Dynamic Creep and Rupture Properties of Temperature Resistant Materials Under Tensile Fatigue Stress. B. J. Lazan. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 757-787; discussion, p. 799-803.

Limitations of static testing and importance of dynamic creep and rupture properties in designing for high-temperature service. Newly developed testing equipment for determining creep and rupture properties. Data on several temperature resistant materials show the influence of dynamic stress on creep and time to rupture. Relationships between testing temperature and dynamic stress influence on creep and rupture. Includes photomicrographs of N-155, S-816, 19-9 DL, and Vitallium. 11 ref. (Q3, Q4, SG-h)

394-Q. Effect of Pulsating Loads on the Creep Characteristics of Aluminum Alloy 14S-T. M. J. Manjoine. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 788-798; discussion, p. 799-803.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 27. See item 9-190, 1949. (Q3, Al)

395-Q. Fatigue Characteristics of Aluminum Alloy 75S-T6 Plate in Reversed Bending as Affected by Type of Machine and Specimen. T. T. Oberg and R. J. Rooney. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 804-812; discussion, p. 813-814.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 28. See item 9-191, 1949. (Q7, Al)

396-Q. Creep and Stress-Rupture Investigations on Some Aluminum Alloy Sheet Metals. J. E. Dorn and T. E. Tietz. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 815-831; discussion, p. 832-833.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 26. See item 3D-43, 1949. (Q3, Q4, Al)

397-Q. The Influence of Vibration on the Creep of Lead. J. Neill Greenwood. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 834-850; discussion, p. 851-856.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 29. See item 3C-110, 1949. (Q3, Pb)

398-Q. Internal Microstrain and the Deformation and Failure of Metals. 1. The Possibilities of Using the Correlation Between Internal Microstrain and Magnetic Properties in the Study of Metal Failure. P. Cavanagh, T. Wlodek, B. Chalmers, and U. Martius. *Canadian Mining and Metallurgical Bulletin*, v. 43, May 1950, p. 251-253; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 53, 1950, p. 166-168.

Fundamental principles which allow development of a new method for studying the deformation and failure of metals in terms of "internal microstrains". The latter and magnetic properties are defined and their influence on metals is outlined. A research program in progress will determine whether magnetic measurements of internal microstrains give sufficiently accurate values for predicting performance of metals under service conditions. (Q24)

399-Q. Surface Effects and the Plasticity of Zinc Crystals. S. Harper and A. H. Cottrell. *Proceedings of the Physical Society*, v. 63, sec. B, May 1, 1950, p. 331-338.

Effects of various surface treatments on the plastic properties of Zn crystals. Roscoe's observation of the hardening effect of a surface film of oxide is confirmed. The Rehbinder effect—softening crystals by immersing them in paraffin and oleic acid—can be produced on oxidized specimens but not on others. 12 ref. (Q23, P10, Zn)

400-Q. Yield Points in Zinc Crystals. H. L. Wain and A. H. Cottrell. *Proceedings of the Physical Society*, v. 63, sec. B, May 1, 1950, p. 339-345.

Sharp yield points can be produced in crystals of Zn containing nitrogen. The gas is introduced in a preliminary melting operation, either by bubbling it through the metal or by allowing it to be absorbed from the atmosphere, using a flux to keep the surface clean. Strain-aging treatments are needed to develop the yield point clearly, but once it is developed it returns at the same level after each successive treatment at the same temperature. General conditions for producing yield points in metals of common crystal structures. 21 ref. (Q23, Zn)

401-Q. A Simple Constant Stress Apparatus for Creep Testing. L. M. T. Hopkin. *Proceedings of the Physical Society*, v. 63, sec. B, May 1, 1950, p. 346-349.

Simple device which can maintain stress on a creep specimen constant to within 0.8% during uniform extensions up to 100%. The apparatus is suitable for slow rates of strain. Examples of creep curves obtained for Pb and a Pb-Sn alloy. Good agreement with the Andrade creep equation was observed in both cases. (Q3)

402-Q. The Mechanical Properties of Some Wrought and Cast Aluminium Alloys at Elevated Temperatures. P. L. Thorpe, G. R. Tremain, and R. W. Ridley. *Journal of the Institute of Metals*, v. 77, Apr. 1950, p. 111-140.

Results of tensile, fatigue, and creep tests at various temperatures in the range 20-450° C. on 17 wrought and 7 cast alloys, together with results for a form of thermal-strain test on some of the cast alloys. Materials tested included some experimental alloys developed during the last war by the Royal Aircraft Establishment in Britain. (Q27, Q3, Q7, Al)

403-Q. The Effect of Applied Load in Micro-Indentation Tests. W. Rostoker. *Journal of the Institute of Metals*, v. 77, Apr. 1950, p. 175-184.

Experiments were conducted with a Bergsman microhardness tester to study the variation of apparent hardness with small applied loads in relation to metallurgical condition. It was found that apparent hardness decreases continuously with decreasing load, and that the rate of decrease is dependent on the capacity of the material for cold work. Thus, the "rule of similarity" which is normally applicable to pyramidal indenters breaks down. 12 ref. (Q29)

404-Q. Relation Between Impact Strength and Micrographic Structure of Two Low-Alloy Steels Having Dif-

ferent Sensitivity to the Temper Brittleness. (In French.) Pierre A. Jacquet. *Comptes Rendus* (France), v. 230, mar. 27, 1950, p. 1284-1286.

Investigated for Ni-Cr and Ni-Cr-Mo low-alloy steels quenched in oil from 850° C., annealed at 650 and 525° C., followed by very slow cooling. Results indicate that the type of fracture depends to a great extent on their respective crystal structures. (Q6, M26, AY)

405-Q. An Attempt To Establish Relationships Between Different Hardness Scales for Gray Cast Iron. (In Polish.) J. Wozniacki. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa,* v. 1, no. 3, 1949, p. 203-211.

Experimental results based on numerous tests with the Brinell machine and the Alpha microhardness tests, on plates cut from a sand-cast bar having pearlitic structure—in the as-cast condition, as well as cast and annealed. Data were analyzed statistically and relations derived. (Q29, CI)

406-Q. Certain Simplifications of the Theoretical Determination of Deformation and Stresses. (In Russian.) I. P. Baikova. *Avtogennoe Delo* (Welding), Feb. 1950, p. 4-8.

A simplified method of determining residual deformations and stresses caused by the heat of welding or by torch or arc cutting was developed for materials in which structural transformations occur in the temperature range corresponding to the metal's plastic state. Theoretical concepts are graphically interpreted. (Q25, K general)

407-Q. Influence of Welding Stresses and Methods for Their Relief on Strength of Welded Structures. (In Russian.) D. I. Navrotskii. *Avtogennoe Delo* (Welding), Feb. 1950, p. 8-13.

Experimental investigation, mainly in two steels, revealed that welding stresses in material possessing sufficient plasticity do not reduce wear resistance of structural parts under either static or dynamic loading; therefore, relief of welding stresses to increase strength seems to be unnecessary.
(Q25, K general, J1, ST)

408-Q. Vanadium-Treated, Non-Aging, Rimming Steel for Deep Drawing Quality Sheet. S. Epstein, H. J. Cutler, and J. W. Frame. *Journal of Metals,* v. 188, June 1950, p. 830-834.

Production and mechanical properties. (Q general, G4, ST)

409-Q. Factors Affecting Deformation and Rupture of Metals at Elevated Temperatures. Francis B. Foley. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, June 1950, p. 845-850.

At high temperatures metallic systems are considered to be in a disturbed state varying from near stability to great activity, from rigidity to fluidity, from strength to weakness. Cast iron used as an example. (Q4, CI)

410-Q. Slip Markings in Chromium. Earl S. Greiner. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 188, June 1950, p. 891-892.

Results show that Cr can be deformed plastically at room temperature by compression combined with hydrostatic pressure to reduce the tensile component normal to the slip planes. 10 ref. (Q24, Cr)

411-Q. An Unusual Effect in the Creep of Zinc Single Crystals. L. Slifkin and W. Kautzmann. *Physical Review,* ser. 2, v. 78, June 1, 1950, p. 631-632.

Experimental procedure and results of an investigation. A curious "rest-harding" effect was found. (Q3, Zn)

412-Q. Why Engine Bearings Fail: 1. Improper Installation; 2. Poor Operation; 3. Faulty Manufacture. *SAE Journal,* v. 58, June 1950, p. 44-47. Based on "Engine Bearings, Construction and Performance", by W. E. Thill.

Fatigue and wear. Materials mentioned are cast iron, steel, and Cu, Sn, and Cd-base alloys.
(Q7, Q9, T7, CI, AY, Cu, Sn, Cd)

413-Q. Polarized Light Shows Nature of Plastic Deformation in Monel Metal. *Journal of the Franklin Institute,* v. 249, June 1950, p. 493-494.

Describes technique.
(Q24, M23, Ni)

414-Q. A New High-Frequency Fatigue Testing Machine. R. Jacquesson and P. Laurent. *Engineers' Digest,* v. 11, May 1950, p. 183. Translated and condensed from *Revue Générale de Mécanique,* v. 34, Jan. 1950, p. 31-33.

Machine is adaptable to varied uses. Amplitude of oscillation as well as length of specimen can be adjusted. Torsion fatigue tests can be taken with a superimposed constant tension. (Q7)

415-Q. Engineering Steels Under Combined Cyclic and Static Stresses. H. J. Gough. *Journal of Applied Mechanics,* v. 17, (*Transactions of the American Society of Mechanical Engineers,* v. 72), June 1950, p. 113-125.

Previously abstracted from *Engineer.* See item 3B-270, 1949.
(Q1, Q5, CN)

416-Q. Stress Studies on Piping Expansion Bellows. F. J. Feely, Jr. and W. M. Goryl. *Journal of Applied Mechanics,* v. 17. (*Transactions of the American Society of Mechanical Engineers,* v. 72), June 1950, p. 135-141.

As a result of failures of stainless steel bellows used to take up thermal expansion in the piping of petroleum and chemical processing equipment, a basis was developed for designing them to operate within reasonable stresses. A formula is derived to show the total stress induced in the material as a result of the combined effects of pressure and movement. (Q25, SS)

417-Q. Influence of the Dimensional Factors on Mode of Yielding and Fracture in Medium-Carbon Steel. II. The Size of the Round Tensile Bar. Julius Miklowitz. *Journal of Applied Mechanics,* v. 17 (*Transactions of the American Society of Mechanical Engineers,* v. 72), June 1950, p. 159-168.

Test results show an increase in axial strain, average true stress, and maximum true stress at the minimum section of the neck of a round tension bar at fracture when the size of the bar is decreased. An explanation is given for the effect on axial strain. Metallurgical variations in data are analyzed and discussed. 12 ref. (Q27, CN)

418-Q. Stresses and Deflections of Cylindrical Bodies in Contact, With Application to Contact of Gears and of Locomotive Wheels. H. Poritsky. *Journal of Applied Mechanics,* v. 17 (*Transactions of the American Society of Mechanical Engineers,* v. 72), June 1950, p. 191-201.

Theoretical discussion.
(Q25, T7, T23)

419-Q. Lateral Buckling of Simply-Supported I-Beams. N. C. Cyr and R. A. Hechtman. *Trend in Engineering at the University of Washington,* v. 2, July 1950, p. 13-16.

Eighteen tests were made to verify a new formula for the lateral buckling of rolled steel wide-flange beams and I-beams. Compares values of nominal bending strength predicted by theoretical analyses with those values determined experimentally. Results indicate that the yield point of steel as well as the modulus of elasticity is necessary to define the buckling strength of the I-beams in this range of the slenderness ratio. (Q28, ST)

420-Q. The Mechanical Properties Available in Cast Iron. J. E. Hurst. *Pig Iron Rough Notes,* Spring-Summer, 1950, p. 11-16.

General discussion. (To be continued.) (Q general, CI)

421-Q. Machine for Testing Rails in Bending Fatigue. Luen B. Banks. *Engineering,* v. 169, May 26, 1950, p. 585-587.

Rails tested are high-tensile steel with a decarburized surface.
(Q7, Q5, T23, CN)

422-Q. Yield Points in Zinc Crystals. *Metal Industry,* v. 76, May 26, 1950, p. 422.
(Q23, Zn)

423-Q. An Account of M. Henri M. Schnadt's Ideas on the Strength of Materials, and His Testing Methods. *Transactions of the Institute of Welding,* v. 13, Apr. 1950, p. 41-56.

Theory of fracture, stress, and structure. New testing technique based on breaking of notched bending specimens in a Charpy machine; test pieces can also be used for static bend tests. Application to steel and to welding. Data for openhearth and bessemer steels and for weld metals. (Q6, K9, ST)

424-Q. Research on Welded Structural Steelwork. J. W. Roderick. *Transactions of the Institute of Welding,* v. 13, Apr. 1950, p. 57-63.

Behavior of rigid frame structures in the plastic range, stressing thinking in terms of factored loads rather than permissible stresses.
(Q25, K general, T26, CN)

425-Q. The Application of the Resonance Vibration Method to the Fatigue Testing of Spot Welded Light Alloys Structures. R. Weck. *Welding Research,* v. 4 (bound with *Transactions of the Institute of Welding,* v. 13), Apr. 1950, p. 33r-38r.

Tests were exploratory, investigating experimental difficulties likely to arise in fatigue testing spot welded Al alloy structures.
(Q7, K3, Al)

R

CORROSION

203-R. Oxidation of Molybdenum in Air at 1100 to 1600° F. B. Lustman. *Metal Progress,* v. 57, May 1950, p. 629-630, 674.

Fundamental principles and actual behavior of Mo and its oxides at above temperatures in air. Experimental data on oxide production on heating for various times and at different temperatures. Amount of oxide which was strongly adherent was also determined. Indicates principles that will lead to a Mo-base alloy with a nonvolatile, impervious, refractory, and protective scale. (R2, Mo, SG-h)

204-R. Titanium: Good But Not Miraculous. Edmond C. Fetter. *Chemical Engineering,* v. 57, May 1950, p. 263-264.

Compares chemical corrosion resistance of Ti and that of Type 316 stainless steel. Ti and Type 316 are "neck-and-neck" as far as corrosion resistance goes—with one important exception. Ti is definitely superior in resistance to solutions of chlorine, chlorides and dilute HCl.
(R general, Ti)

205-R. Design of Cathodic Protection for Open-Box Type Coolers. C.

R. Draughon, Jr., and E. B. McNeil. *Petroleum Refiner*, v. 29, May 1950, p. 97-103.

Economic data show value of the installation. Pipe coils are carbon steel. (R10, CN)

206-R. Optical Studies of the Oxidation of Iron at Temperatures in the Range 20-265° C. A. B. Winterbottom. *Journal of the Iron and Steel Institute*, v. 165, May 1950, p. 9-22.

Optical investigations using an improved experimental technique. Results show that films up to 100-250 A. in thickness consist mainly of magnetite, or possibly γ-ferric oxide, while on films of greater thickness an outer layer of α-ferric oxide is formed. Rate of film growth appears to depend on crystal orientation, atmospheric moisture, and polish and cold work. The last retards film growth, possibly as a result of preferred orientation. The growth process does not appear to depend upon whether the film is formed on iron, or on ferrous alloys of the stainless type. 30 ref. (R2, Fe)

207-R. Corrosion Fatigue—The Influence of Disarrayed Metal. D. Whitwham. *Journal of the Iron and Steel Institute*, v. 165, May 1950, p. 72-79.

Experiments to determine whether a preliminary period of dry fatigue lengthens the normal corrosion-fatigue life by strain hardening, or shortens it by producing disarrayed metal which may be particularly susceptible to corrosion. With both cold-drawn and annealed mild steel wires, little or no change in corrosion-fatigue life was brought about by preliminary dry fatigue under the conditions tested. A metallographic study was also made of changes during air-fatigue and corrosion-fatigue processes. Relations between corrosion fatigue and other forms of failure. (R1, CN)

208-R. The Corrosion of the Austenitic Stainless Steels. (Concluded.) Part IV. Effect of Alloying Elements and of Corrosive Media. G. T. Colegate *Metallurgia*, v. 41, May 1950, p. 362-366.

(R general, SS)

209-R. Oxidation of Cemented Carbides. R. Kieffer and K. Kölbl. *Powder Metallurgy Bulletin*, v. 5, May 1950, p. 38-39.

Results of oxidation using Ti and W carbides. (R2, Ti, W, C-n)

210-R. Passivation of Metals. Rudolph Speiser, F. H. Beck, M. G. Fontana, and E. N. Lassettre. *Journal of Chemical Physics*, v. 18, May 1950, p. 772-773.

Theoretical explanation of phenomenon of passivation. (R10)

211-R. Theory of the Oxidation of Metals. N. Cabrera and N. F. Mott. *Reports on Progress in Physics*, v. 12, 1949, p. 163-184.

Recent theoretical and experimental work. The formation of stable films at low temperatures, the region of intermediate temperatures, the parabolic law, and adhesion and crystal form of an oxide film. 28 ref. (R2)

212-R. Use of Magnesium Anodes for the Protection of Pipe Lines. W. F. Higgins. *Magnesium Review and Abstracts*, v. 3, Dec. 1949, p. 99-119.

Theory and process of corrosion, theory of protection, requirements of a galvanic anode, magnesium as an anode, bacterial corrosion of iron pipes, practical implications of the method, pipe line surveys, electrical connections to pipe lines, and special anodes. Concerned for the most part with cast iron and steel pipe. (R10, Mg, CI, CN)

213-R. Report of Committee A-5 on Corrosion of Iron and Steel. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 110-112.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 3. See item 6B-102, 1949. (R11, Fe, ST)

214-R. Effect of Weather on the Initial Corrosion Rate of Sheet Zinc. O. B. Ellis. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 152-167; discussion, p. 168-170.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 10, 1949. (R3, Zn)

215-R. The Corrosion and Protection of Magnesium Alloys. Norman Bryce Harvey. *Journal of the Birmingham Metallurgical Society*, v. 30, Mar. 1950, p. 26-40.

Mechanism of corrosion. Effect of metal impurities, specific chemicals and solution, the atmosphere, and stress corrosion. Methods of testing corrosion susceptibility. Protection by alloying, and by surface treatment, and protection from galvanic corrosion. 15 ref. (R general, Mg)

216-R. The Bacterial Corrosion of Iron and Concrete. *Mining Journal* (London), v. 234, May 5, 1950, p. 450-451.

(R1, Fe)

217-R. Corrosion of Steel by Electrolytes Used in Chromium Plating Plants. (In German.) Lisel Koch. *Metalloberfläche*, sec. A, v. 4, May 1950, p. 65-68.

Results show that the steel is subject to intercrystalline corrosion, the electrolyte attacking mainly the cementite. Corrosion can be prevented by using low-carbon or carbon-free iron, using steel whose surface has been decarburized, or using steel that has been annealed to produce granular pearlite. These conclusions were experimentally tested and confirmed. (R2, L17, ST)

218-R. Corrosion Behavior in Very Dilute Aqueous Solutions. III. Corrosion at Temperatures Below 100° C. (In German.) L. W. Haase. *Werkstoffe und Korrosion*, v. 1, Apr. 1950, p. 129-132.

Presents results of experiments from 20 to 100° C. Data for carbon steel and cast iron. (R5, CN, CI)

219-R. Corrosion of Brass Tubes by River Water and Its Prevention. (In German.) J. Bünger. *Werkstoffe und Korrosion*, v. 1, Apr. 1950, p. 133-136.

Brass has a pronounced tendency to selective corrosion, especially to "dezincification" and cracking due to tensile stress. Conditions under which these phenomena occur. Two recrystallized, fine-grained brasses were not subject to selective corrosion, provided they have been properly heat treated and worked. (R2, R4, Cu)

220-R. The Rate of Corrosion of Metals in Acid Solutions Containing Depolarizers. Melvin Hochberg and Cecil V. King. *Journal of the Electrochemical Society*, v. 97, June 1950, p. 191-197.

The action of various quinones and dyes as corroding agents in acid solution on Cd, Sn, Pb, and Cu. Inhibition by reduction products or intermediate compounds, 13 ref. (R5, Cd, Sn, Pb, Cu)

221-R. A Polarographic Method for the Indirect Determination of Polarization Curves for Oxygen Reduction on Various Metals. I. Description of the Method—Case of Platinum. II. Application to Nine Common Metals. Paul Delahay. *Journal of the Electrochemical Society*, v. 97, June 1950, p. 198-212.

Deals with electrolytic reduction. The complete polarization curve was determined. Contributions of the two and four electron reduction processes, i. e., reductions of O_2 to H_2O_2 and N_2O are also calculated. Equilibrium conditions for the electrolytic reduction of oxygen are derived from thermodynamic data. Method is applied to Al, Zn, Mg, Ni, Fe, Ag, Cu, Sn, and Pb. 30 ref. (R11, Pt, EG-a)

222-R. Corrosive Environments and Methods of Mitigation in Producing Sour Crude. D. A. Shock and J. D. Sudbury. *Oil and Gas Journal*, v. 49, June 8, 1950, p. 73-74, 76.

Corrosion in well, aqueous hydrocarbon, and vapor environments encountered in handling crude. Corrosion of K monel, Inconel, and high Cr-Ni steel equipment. 15 ref. (R7, AY, Ni)

223-R. Design of Cathodic Protection For Open-Box-Type Coolers. C. R. Daughon, Jr., and E. B. McNeil. *Oil and Gas Journal*, v. 49, June 1, 1950, p. 76-78, 80, 82; *Petroleum Processing* v. 5, June 1950, p. 629-632.

Cathodic protection at the Baton Rouge refinery of Esso Standard Oil Co. retards or prevents waterside corrosion to such an extent that the alloy steel used at the present time may be replaced by carbon steel. (R10, AY, CN)

224-R. The Corrosion and Lining of Sulphate Digesters. T. T. Collins, Jr. *Paper Trade Journal*, v. 130, May 25, 1950, p. 32-34, 36, 38; June 1, 1950, p. 20-22.

Bibliography includes detailed abstracts of papers published through 1949. (R5, T29, ST)

225-R. Scale Deposit Prevention in Gas Lift Wells. R. B. Walter. *World Oil*, v. 130, June 1950, p. 228, 230-231.

Use of down-the-hole assemblies of Zn and Cu to set up galvanic action to prevent scaling on the pump, tubing, and other units of the flow string. (R10, T28, Cu, Zn)

226-R. Corrosion on New Distillation Unit Processing Low Sulfur Crude. D. L. Burns. *Corrosion* (Technical Section), v. 6, June 1950, p. 169-177.

Nature of corrosion in the furnace tubes, factors involved, and remedial measures used. Crude charged averaged 0.20% sulfur content. Ammonia injection was used in neutralizing corrosive elements in the atmospheric tower overhead steam, and alloy steel tubes were substituted for carbon steel in the radiant section of the furnace. Corrosion rates for the carbon steel heater tubes are plotted vs. temperature and compared to those experienced when processing crude containing 1.5% sulfur. Marked effects which tube wall temperatures have on the corrosion rates. 10 ref. (R7, CN, AY)

227-R. Corrosion in Condensate and in High Pressure Sweet Oil Wells. R. C. Buchan. *Corrosion*, (Technical Section), v. 6, June 1950, p. 178-185.

Joint designs, thread lubricants, and tube installation practices. Use of low-carbon steel, 9% Ni steel, internally Ni-plated steel, and plastic-coated steel tubing. Various chemicals used as neutralizing agents, emulsifying and/or wetting agents, and other film-forming materials. Use of sodium silicate. Methods of determining corrosive conditions and efficiency of methods used to prevent corrosion. (R7, CN, AY)

228-R. The Role of Polarization in Electrochemical Corrosion. R. H. Brown, G. C. English, and R. D. Williams. *Corrosion* (Technical Section), v. 6, June 1950, p. 186-195.

Idealized schematic and actual polarization diagrams. Methods of correlating polarization with corrosion data. Method for obtaining con-

tribution made by the polarization of each electrode reaction to the total polarization observed at an electrode and its implications in evaluating true over-voltage values. Relationship of IR drop at metal liquid interfaces to polarization diagrams and voltage concepts. 13 ref. (R1)

229-R. Corrosion in Sulfur Production; the Use of an Alloy Protective Coating. Norman Hackerman and D. A. Shock. *Corrosion* (Technical Section), v. 6, June 1950, p. 195-200.

Apparatus devised and installed in the field for measuring the rates of corrosion during various phases of sulfur production. Severe corrosion occurred only when water and molten sulphur were in contact with the steel surfaces together. Coatings containing Zn, Mg, and Al were found to be uniformly more corrosion resistant than galvanizing alone. (R6, L16, CN, ZN)

230-R. Interference From Forced Drainage. Robert Pope. *Corrosion* (Technical Section), v. 6, June 1950, p. 201-207.

A method for determining the interference which may be expected on a long structure due to forced drainage on a similar parallel structure is applied to 4-in. welded bare steel pipes. Effects of coatings, changes in soil resistivity, longitudinal conductivity and diameter of structures, distance to anode, and separation of structures. (R8, CN)

231-R. Steel, Heat and Water: Localized Formation of Magnetic Iron Oxide in Power Boilers. H. M. Rivers and W. M. Sonnett. *Blast Furnace and Steel Plant*, v. 38, June 1950, p. 694-696, 720, 722-723.

Pitting corrosion, attack on a heat-transfer surface by caustic in concentrating film, caustic attack under adherent deposits, hydrogen damage, effects of temperature, and corrosion fatigue. (R4, CN)

232-R. Protection of Steel in Off-Shore Structures. F. L. LaQue. *Drilling*, v. 11, June 1950, p. 29-31, 102-103.

Cathodic protection, Monel facing, and paint for various sections under water and underground. (R4, R8, CN)

233-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 42, June 1950, p. 63A-64A.

Theory, causes, and mechanism of fretting corrosion, and preventive measures. (R1)

S

INSPECTION AND CONTROL

222-S. Standardization of Toolsteels in Sweden, *Metal Progress*, v. 57, May 1950, p. 643, 678. Translated and condensed from *Verkstäderna* (Sweden), v. 44, 1948, p. 166+.

Includes tabulation of compositions of 18 standard types, showing Brinell hardness and ASM Handbook type for each. (S22, TS)

223-S. How To Specify Copper Alloys. *Steel*, v. 126, May 22, 1950, p. 84.

Based on pamphlet by James T. Duffy, Jr., published by Riverside Metal Co. (S22, Cu)

224-S. Better Weldments Through "Tailored" Quality Control. Orville T. Barnett. *Steel*, v. 126, May 22, 1950, p. 80-82.

Essential features, including design, procedure, operator training, inspection, testing, and microscopic examination. A few typical examples. (S12, K general)

225-S. Why Machine Parts Fail. Part 1. Fracture and Inherent Strength. Charles Lipson. *Machine Design*, v. 22, May 1950, p. 95-100.

First of a series of articles based on studies of service failures extending over several years. Recognition, classification, and analysis of metal fractures. 10 ref. (S21, Q26)

226-S. Impeller Inspection. *Aircraft Production*, v. 12, May 1950, p. 145-147.

Solex installation for production checking of gas-turbine blade thickness and profiles. In this system a number of pneumatically operated styluses are used to compare the profile of the blade with that of a master, at predetermined coordinates. Results are shown on a series of dials, each corresponding to one stylus-point. (S15)

227-S. Simultaneous Spectrophotometric Determination of Cobalt, Copper, and Iron. R. E. Kitson. *Analytical Chemistry*, v. 22, May 1950, p. 664-667.

16 references. (S11, Co, Cu, Fe)

228-S. Some Aspects of Automatic Control of Heat-Treatment Furnaces. A. Linford. *Metal Treatment and Drop Forging*, v. 17, Spring 1950, p. 53-60, 62.

Application of basic principles in various types of commercial equipment. (S16, J general)

229-S. Temperature Measurement Without Time-Lag for Rapidly Moving Objects, Especially as Applied to Flame Hardening. (In German.) W. Hunsinger and H. W. Grönegress. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 92, Apr. 21, 1950, p. 285-290.

A new incandescent-filament pyrometer which instantaneously indicates when any desired temperature has been reached. A number of uses of this instrument are briefly discussed. (S16, J2)

230-S. An Electronic Tramp Iron Detector for Ore Conveyor Belts. C. M. Marquardt. *Mining Engineering*, v. 187, June 1950; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 187, 1950, p. 703-705; discussion, p. 706.

Tramp iron and steel moving on a conveyor belt cause small currents to be generated in a coil situated in a strong magnetic field, which are converted to an alternating current and are amplified. Output voltage from the amplifier fires a thyratron with a relay in its anode circuit, which actuates a howler and simultaneously drops a spot of marker material on the belt. (S10, B general, Fe)

231-S. A Thickness Gauge for Ceramic Coatings. C. C. Gordon and J. C. Richmond. *Finish*, v. 7, June 1950, p. 35, 61.

Electromagnetic method of measuring thickness of coatings (paint, plastic, ceramic, and other nonconducting films) applied on nonmagnetic metal bases. (S14)

232-S. Spectrographic Determination of Magnesium in Nodular Iron. Ford R. Bryan, G. A. Nahstoll, and H. D. Veldhuis. *Foundry*, v. 78, June 1950, p. 102-103, 244-248; discussion, p. 248-249.

Previously abstracted from *ASTM Bulletin*. See item 2-S, 1950. (S11, Mg, CI)

233-S. High Strength Steel Bolts. C. L. Harvey. *Fasteners*, v. 6, no. 3 (1950), p. 10-12.

New ASTM standard. Table gives mechanical properties of different sizes. (S22, T7, ST)

234-S. Report of Committee A-1 on Steel. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 84-89.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 1. See item 12-129, 1949. (S22, ST)

235-S. Report of Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel, and Related Alloys. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 133-140.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 7. See item 6B-103, 1949. (S22, R3, AY, SS)

236-S. Report of Committee B-4 on Electrical Heating, Resistance and Related Alloys. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 171-173.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 11. See item 12-130, 1949. (S22, SG-q)

237-S. Report of Committee B-5 on Copper and Copper Alloys, Cast and Wrought. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 174-202.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 12. See item 12-131, 1949. (S22, Q27, Cu)

238-S. Report of Committee B-7 on Light Metals and Alloys, Cast and Wrought. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 205-214.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 14. See item 12-132, 1949. (S22, Al, Mg)

239-S. Report of Committee E-3 on Chemical Analysis of Metals. *American Society for Testing Materials, Proceedings*, v. 49, 1949, p. 506-511.

Previously abstracted from *American Society for Testing Materials*, Preprint No. 73. See item 10A-104, 1949. (S11)

240-S. Butt Weld Testing With the Hughes Supersonic Flaw Detector. *Machinery* (London), v. 76, May 11, 1950, p. 667-668.

Diagram and description show principle involved. (S13)

241-S. Concerning the Standardization of Soft and Hard Solders. (In German.) Erich Lüder. *Metalloberfläche*, sec. B, v. 2, Apr. 1950, p. 56-58; May 1950, v. 4, p. 70-72.

Discusses and criticizes present standards. Compositions of successfully used soft, hard, and silver solders for noble, base, and light metals. (S22, SG-f)

242-S. Electronic Controls as Used in Finishing Steel. Richard W. Barnitz. *Blast Furnace and Steel Plant*, v. 38, June 1950, p. 649-655.

Controls used for various fabricating procedures. (S18)

243-S. The Use of the Spectroscope in the Steel Industry. E. O. Waltz. *Blast Furnace and Steel Plant*, v. 38, June 1950, p. 662-665.

Method used on samples in process. Resulting man-hour reduction and increased production. (S11, ST)

244-S. Device Sorts Steel. *Blast Furnace and Steel Plant*, v. 38, June 1950, p. 688-689.

Instrument developed by Jones & Laughlin, which separates semifinished and finished steel products that have become mixed, and differentiates between all types of carbon steel by responding to magnetic differences in the metals, regardless of whether they are chemical, physical or metallurgical. (S10, CN)

245-S. Why Machine Parts Fail. Part 2. Origin and Growth of Cracks. Charles Lipson. *Machine Design*, v. 22, June 1950, p. 111-116.

The slip theory. The three initial stages that mark crack origin; how the heat-tint method shows crack

growth; and how stress reorientation influences crack direction. (S21, Q26)

246-S. A Thickness Gage for Ceramic Coatings. Charles C. Gordon and Joseph C. Richmond. *Better Enameling*, v. 21, June 1950, p. 22-23.

Previously abstracted from *Finish*. See item 231-S, 1950. (S14, L27)

247-S. Measurement of Surface Roughness. Part I. E. Green. *Finish*, v. 7, June 1950, p. 27-30.

Instruments and methods used for comparing, measuring, and delineating surface profiles of metallic materials. (To be continued.) (S15)

248-S. Eight Simple Tests Separate Stainless Grades. *Steel*, v. 126, June 19, 1950, p. 94, 96.

Nitric acid test, magnet test, spark test, hardness test, muriatic acid tests, surface spot test, nickel spot test, and stabilization test. (S10, SS)

249-S. A New Wall-Thickness Gauge for Ferromagnetic Materials. R. Berthold. *Engineers' Digest*, v. 11, May 1950, p. 162-163. Translated and condensed.

Previously abstracted from *Stahl und Eisen*. See item 195-S, 1950. (S14)

250-S. Contour and Profile Investigation. Part I. *Aircraft Production*, v. 12, May 1950, p. 161-166.

Inspection of gas-turbine components by a British firm. Includes recording of profiles on smoked glass. (To be continued.) (S15)

251-S. (Book) **Spectrochemical Procedures.** Charles E. Harvey. 402 pages. Applied Research Laboratories, 7707 Michigan Ave., Detroit, Mich. $7.50.

Quantitative and qualitative methods of spectrochemical analysis presented with a minimum of theory. The procedures described are sufficiently general that they may be applied to any combination of commercial or custom-made instruments. Method principally refer to photographic instruments, although basic principles and variables apply to quantometers and visual instruments as well. (S11)

T

APPLICATIONS OF METALS IN EQUIPMENT

266-T. Materials at Work. *Materials & Methods*, v. 31, May 1950, p. 76-78.

Briefly describes and illustrates the following: Ni-clad copper wire; vanadium and amberyl screwdriver; Alnico grate; carbide-faced pulverizer pegs. (T general)

267-T. Redesigning in Magnesium Promotes Economy, Structural Simplicity, Better Service. J. P. Donald Garges. *Modern Metals*, v. 6, May 1950, p. 17-19.

Redesign of F-80 fighter wing in Mg. The wing was originally of conventional Al construction involving a multitude of parts and fastenings. The new Mg wing contains only 31% as many parts and 38% as many fastenings. (T24, Mg)

268-T. Bucks County Enterprises. *Modern Metals*, v. 6, May 1950, p. 21-22.

Above firm makes Al materials-handling equipment. (T5, Al)

269-T. Electrical Substations: a Growing Use for Structural Aluminum. A. M. Baker. *Modern Metals*, v. 6, May 1950, p. 23-24.

(T1, Al)

270-T. Building Boom Boosts Use of Aluminum Extrusions. F. L. Church. *Modern Metals*, v. 6, May 1950, p. 26-28.

Various types of structural extrusions and how they fit into the structure of buildings. (T26, Al)

271-T. Castings Cut Costs; Aluminum Serves as Economizer in Modernair Pressure Systems. John E. Goldring. *Modern Metals*, v. 6, May 1950, p. 38-40.

(T27, Al)

272-T. Stainless-Clad Steel for Digesters. W. H. Funk and E. H. Wyche. *Paper Trade Journal*, v. 130, May 18, 1950, p. 23-24, 26, 28, 30.

Advantages to be gained by using stainless-clad steel digesters for sulfate and sulfite pulping. Selection and application of the proper types of stainless-clad. (T29, SS)

273-T. Agricultural Implements. *Iron and Steel*, v. 23, May 1950, p. 147-150.

Various examples of weight saving by choice of suitable steels. (T3, ST)

274-T. Ski-Jumping on Hampstead Heath. *Light Metals*, v. 13, May 1950, p. 227-229.

Use of Al alloy tubing in structure built for ski-jumping near London where the usual hills are unavailable. (T10, Al)

275-T. Pirelli Aluminum Sheathed Cable. *Light Metals*, v. 13, May 1950, p. 234-235.

Fabrication by cold pressure welding. (T1, K5, Al)

276-T. Aluminum at the British Industries Fair—1950. *Light Metals*, v. 13, May 1950, p. 243-291.

Comprehensive classified survey, including company names and addresses. (T general, Al)

277-T. Plant for Peat Winning. *Light Metals*, v. 13, May 1950, p. 292-294.

Various applications of Al and alloys in equipment of peat-recovery industry in Ireland. (T29, Al)

278-T. Flashings in Super-Pure Aluminium. *Light Metals*, v. 13, May 1950, p. 295-297.

In contrast with unalloyed Al of normal commercial grades, superpure Al is characterized by its resistance to work hardening; specialized forming operations are thereby simplified. (T26, G general, Al)

279-T. The "Bourse-O.T.H." Method for Mass Construction Based on Utilization of Cast "Alpax" Forms for Concrete Pouring. (In French.) *Revue de l'Aluminium*, v. 27, Mar. 1950, p. 103-105.

Special cast Al-alloy concrete-pouring forms designed for use in mass production of dwelling units and other buildings. (T26, Al)

280-T. Electric Generators of High Efficiency and Light Weight. (In French.) Henry Lanoy. *Revue de l'Aluminium*, v. 27, Mar. 1950, p. 109-112.

Generators designed for aircraft use. Extensive use is made of light and extra-light alloy parts. (T1, T24, Al, Mg)

281-T. Magnesium Reduces Worker Fatigue. *Magazine of Magnesium*, May 1950, p. 2-5.

Miscellaneous applications to metalworking tools, materials handling equipment and various other products in various industries. (T5, Mg)

282-T. Reynold's Phoenix Plant Shows New Integrally Stiffened Skins. *Western Metals*, v. 8, May 1950, p. 23.

Miscellaneous applications. (T26, Al)

283-T. L & N's "1970" Leads New Motive Power to Increased Tonnage Ratings. *Vancoram Review*, v. 6, No. 3, 1950, p. 6-8.

Emphasizes applications of vanadium steel in new locomotive. (T23, AY)

284-T. Vanadium Data Sheet: Vanadium Steels and Irons for Diesel Application. *Vancoram Review*, v. 6, No. 3, 1950, p. 12-17.

Table gives applications, designations, compositions, heat treatments, mechanical properties and remarks for various steel and iron compositions. (T23, AY, CI)

285-T. A New Chromium Long-Life Litho Plate. D. N. Adams. *National Lithographer*, v. 57, May 1950, p. 32-33, 71, 73, 79.

Reviews some of the pertinent chemical properties of the metals which alone or as alloys make up most polymetallic plates. Development of a deep-etch plate utilizing Cr in the nonworking areas and hydrophobic organic coatings in the working areas. Development of an etching solution included evaluation of Au, Ir, Pd, Pt, and Ru as catalytic agents for release of hydrogen on contact of HCl with Cr. (T9, P13, Cr)

286-T. Study of Core Wire for Electrodes. C. B. Voldrich, D. C. Martin, and P. J. Rieppel. *Welding Journal*, v. 29, June 1950, p. 265s-284s.

Influence of various types of core wire on the operating characteristics of welding electrodes and on strength, ductility, and soundness of weld metals. Core wire variables studied were type of steel (rimmed, capped, semikilled, killed), location of core wire in heat, chemical composition, and physical characteristics. (T5, ST)

287-T. Quality Control of Aircraft Sandwich Materials. Herbert B. Epstein. *Aero Digest*, v. 60, June 1950, p. 38-39, 100-101.

Various quality-control methods developed at Chance Vought Div. of United Aircraft Corp. to monitor the quality of their "Metalite"-bonded structures which consist of thin facings of high-strength Al alloy bonded to a relatively thick, lightweight balsa core. Its smoothness, high strength and light-weight properties give it advantages over conventional construction. T24, S general, K11, Al)

288-T. Rock Drilling With Tungsten Carbide Bits. J. H. Fulton, A. G. Douglass, and J. Beattie. *Canadian Mining and Metallurgical Bulletin*, v. 43, May 1950, p. 254-258; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 53, 1950, p. 169-173.

Methods used and results obtained in test work with smaller-bore, lighter-weight rock drills. (T28, W, C)

289-T. Metals as Money. Robert J. Edmunds. *Canadian Metals*, v. 13, May 1950, p. 43, 51.

Coinage in North America, and types and minting of coins from Ag, Ni, and Cu alloys. Minting process from metal melting to coin storage. (T10, Ag, Cu, Ni)

290-T. Aluminum in the Film Industry. *Metal Industry*, v. 76, May 12, 1950, p. 386-387.

Miscellaneous applications. (T9, Al)

291-T. Seven Ways To Produce Turbine Blades. *SAE Journal*, v. 58, June 1950, p. 48-52. Based on "Blade Design and Production", by A. T. Colwell, K. M. Bartlett, and R. E. Cummings.

Processes are forging, lost wax, machining, fabrication (sheet-stock forming), powder metallurgy, rolling, and mercast (precision casting with frozen mercury patterns). Materials mentioned are iron and Type 403 stainless. Illustrated. (T25, E15. F22, F23, G1, G17, H general, CI, SS)

292-T. Welded Alloy Steel Tank Operates at −300° F. *Inco,* v. 24, Spring 1950, p. 10, 29.

Welded tank constructed of AISI 2800 can handle working pressures up to 600 psi. or full vacuum, and withstand impact at this low temperature. (T26, Q6, AY)

293-T. Metals for Gas Turbines. Norman L. Mochel. *Mechanical Engineering,* v. 72, June 1950, p. 462-466.

Previously abstracted from *American Society of Mechanical Engineers,* Paper No. 49-A-85. See item 245-T, 1950. (T25, SG-h)

294-T. Australia's Welded Highway Bridges. V. Karmalsky. *Engineering News-Record,* v. 144, June 1, 1950, p. 39-41.

Welded shop fabrication and riveted field erection. Includes mechanical properties of steel. (T26, K general, Q general, ST)

295-T. Proper Care for Hollow Steel Will Cut Your Drilling Costs. W. H. McCormick and C. W. Darby. *Engineering and Mining Journal,* v. 151, June 1950, p. 74-76.

Proper drilling, forging, and annealing techniques to cut failure in drill tools. (T6, F22, J23, TS)

296-T. Aluminum Sheathed Impregnated Pressure Cable. *Machinery Lloyd* (Overseas Edition), v. 22, May 13, 1950, p. 99. (T1, Al)

V

MATERIALS
General Coverage of Specific Materials

124-V. A New High-Strength Aluminum Die-Casting Alloy. J. J. Warga, J. J. Preisler, and S. B. Ashkinazy. *Metal Progress,* v. 57, May 1950, p. 618-622.

In the example described, an Al alloy was desired that could be die cast and that would have elastic strength higher than any available Al die-casting alloy. The problem was solved by adding Si to an Al-Mg-Zn alloy that had been used previously in the form of investment castings. The specific application is the gimbal ring used in several gyroscopic instruments. (Q21, T8, E13, Al)

125-V. Metals and Refractories Combined in High-Temperature Structural Parts. John B. Campbell. *Materials & Methods,* v. 31, May 1950, p. 59-63.

Appraises the new high-temperature materials known variously as cermets, ceramals, or metal-ceramics. Physical and mechanical properties, and applications. (H general, SG-h)

126-V. Stainless Steels—Their Selection and Application. T. C. Du Mond. *Materials & Methods,* v. 31, May 1950, p. 83-98.

Manual tells what stainless steels are, their properties, and conditions governing their selection and application. (SS)

127-V. Wrought Coppers and Plain Brasses; Typical Properties and Uses. *Materials & Methods,* v. 31, May 1950, p. 99, 101.

Tables cover 9 types. (Cu)

128-V. Additions of Zirconium and Rare Earth Extend Magnesium's Range of Applications. W. D. Danks. *Modern Metals,* v. 6, May 1950, p. 34-36.

Properties and applications of "Z5Z"—4.5% Zn and 0.7% Zr; and "ZRE1"—2.5% Zn, 0.7% Zr, and 3.0% rare-earth metals. These alloys were developed for jet-propulsion engines, but are said to be promising for other applications. (T25, Mg)

129-V. Ductile Cast Iron; A New Engineering Material. William H. Sparr. *Mines Magazine,* v. 40, May 1950, p. 25-29.

Production, structure and transformations, mechanical properties, and applications. (CI)

130-V. Cerium. L. Sanderson. *Canadian Mining Journal,* v. 71, May 1950, p. 71-72.

Sources, production of Ce alloys, and uses in the form of compounds and alloy ingredients, also as inoculants in refining of cast iron. (Ce)

131-V. Preliminary Research on Wrought Aluminum Bronzes Containing Beryllium. (In Italian.) C. Panseri. *Alluminio,* v. 19, No. 1, 1950, p. 9-17.

Results of experiments on nine new compositions. On the basis of micrographic and tensile tests, it appears that alloys containing 4.5-5% Al, 0.9-1.1% Be, Cu, remainder; and 6.5-7.0% Al, 0.3-0.4% Be, Cu remainder are promising. As additional elements, Ni and Ag are of principal importance. Corrosion resistance and workability were also evaluated. 10 ref. (Q23, R general, M27, Cu)

132-V. Characteristics of "C46"—A New Heat Resistant Cast Light Alloy. (In Italian.) *Alluminio,* v. 19, No. 1, 1950, p. 59-69.

Details of physical, mechanical, and structural characteristics of Al alloy containing 10% Cu, 1% Si, 0.25% Mg, 0.15% Ti, and 1.5% Ni. (Q general, P general, M27, Al)

133-V. High Carbon Ferro Chromium. F. F. Franklin. *Vancoram Review,* v. 6, No. 3, 1950, p. 9-11.

Development, production, properties, and applications in refining of steels and cast irons. (Fe-n)

134-V. Ferro-Alloys in 1949. R. G. Knickerbocker. *Mining Engineering,* v. 187, June 1950, p. 663-665.

Previously abstracted from *Journal of Metals.* See item 70-V, 1950. (B22, Fe-n)

135-V. Type Metals and Their Care. William C. Otter. *American Pressman,* v. 60, May 1950, p. 30, 32, 34.

Compositions, properties, and impurities. Recommended procedures for remelting and drossing, including temperature controls. (SG-e, Pb)

136-V. Extraction, Alloying and Fabrication of Magnesium. C. J. P. Ball. *Magnesium Review and Abstracts,* v. 3, Dec. 1949, p. 120-142.

Raw materials, electrolytic extraction processes, thermal production, alloying, melting, casting, fluxing, pouring, machining, corrosion, and uses. (Mg)

137-V. Strict Production Controls Assure Precision Manufacture of Welding Pipe Fittings. Phil R. Becker. *Steel,* v. 126, June 12, 1950, p. 95-98, 100.

Material specifications, metallurgy, machining, and welding operations required for producing piping installations which must be resistant to high pressures, temperatures, or corrosive substances. Carbon and stainless steel, wrought iron, Cr-Ni alloys, Ni, Al, and Monel are among the metals used. (K general, SG-g, h, CN, SS, Fe-m, Ni, Al)

138-V. Speaking of Light Weight. George Kende. *Die Castings,* v. 8, June 1950, p. 21-23, 60, 66-67.

Magnesium die-cast components and their use. Design, ease of finishing, and machinability. (Mg)

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PROCESS METALLURGIST: Age 48. Extensive experience in nonferrous and precious metals industry, including research development, control, metallography, physical testing, inspection and setting-up process and method standards. Desires position as metallurgist, assistant metallurgist or sales engineer with a progressive company where ability and integrity will be appreciated. Available immediately. Location not important. Box 7-70.

MECHANICAL ENGINEER: B.S. in metallurgical engineering. Registered, age 29, married. Graduate credit in metallurgy. Two years experience in aluminum utensil production and sheet quality control. Four years extensive development work in mechanical finishing methods, anodizing and dyeing of aluminum products. Desires position in metals fabrication, production or plant engineering. Box 7-75.

ENGINEER EXECUTIVE: Graduate; age 39. Seasoned in all phases of metal fabrication, engineering and manufacturing. Experienced as assistant chief engineer, assistant works manager, chief production engineer. Detailed in factory cost, metallurgy, welding engineering, tooling, plant layout, industrial engineering, new product design and management. Salary—five figures. Box 7-80.

METALLURGICAL ENGINEER: B.S. in metallurgical engineering, 1942. Age 33, single. Over seven years experience in heat treatment, physical testing, failure analysis, metallography and development on ferrous and nonferrous alloys, radiography of aluminum and magnesium castings. Desires position in research and development or production in New England or Northern U. S. Available immediately. Box 7-85.

METALLURGICAL ENGINEER: Nine years of industrial experience, specialized in ferrous production. Qualified to supervise specification and acceptance of material, metallurgical control of production processes (welding, forging, machining, heat treat) and laboratory. Also experienced with customer complaints and development. B.S., age 34, dependents, employed. Prefers heavy industry (as oil tool, or special machinery) in West, Southwest, or New England. Box 7-90.

METALLURGIST: B.S. Eighteen years metallurgy of stainless, alloy and carbon steels. Experienced in research, production and customer contact. Married, two children. Midwest preferred. Box 7-95.

METALLURGIST: B.S., M.S. in metallurgy. Age 31, married. Six years experience in nonferrous research and development. Employed at present. Desires position with responsibility and future in Cleveland area. Box 7-100.

VIGOROUS MAN OF 59: Experienced technical advisor and consultant; administrator and businessman; coordinator of extensive research programs. Familiar with patents and licensing. Thirty years experience with commercial metals including production and manufacture; industrial and management work; technical sales and sales development. Box 7-105.

METALLURGICAL ENGINEER: B.S. in chemical engineering. M.S. in metallurgical engineering Registered professional engineer. Twenty five years comprehensive background in ferrous, nonferrous and stainless metals. Experience in industry, teaching, research and specifications. Box 7-110.

RESEARCH ASSOCIATE: For metallurgical industry. B.S., 1943; age 31. Two and one half years experience as research associate and one year teaching experience. Any location. Box 7-115.

METALLURGICAL ENGINEER: B.S. from Virginia Polytechnic Institute, 1949. Age 27, single, veteran. Two years industrial experience in chemical plant, plant control laboratory, prefers ferrous training program leading to position of responsibility in manufacturing, development, research, or liaison work between engineering and administrative groups. Available immediately. Will consider any location. Box 7-125.

SALES AGENCY WANTED: By retired expert in heat treating of steels, all grades. Thirty five years of diversified experience as heat treater, supervisor, and five years in sales. Practical metallurgist, demonstrator and trouble shooter. Product or service must be of interest to heat treat practice. Location, New York State. Box 7-130.

METALLURGICAL ENGINEER: Nonferrous preferred. B.S. from Carnegie Institute of Technology. Unmarried, veteran, age 25. One year on training program of large electrical concern. Box 7-135.

SALES ENGINEER. B.S. in metallurgy. Mill and sales experience in tool, die and specialty steels. Age 28, present income $8500. Desires position with administrative responsibilities. Box 7-140.

METALLURGIST: With four years nonferrous rolling mill experience in lead, tin, zinc and aluminum. Was lecturer in mechanical engineering. Graduate metallurgist, married, age 31. Available immediately. Prefers location in eastern U. S. Box 7-145.

RECENT GRADUATE: B.S. in metallurgical engineering. Especially interested in production control or research and development. Single, 22 years old, good health. Prefers to locate in Midwest. Box 7-150.

METAL FINISHING EXPERT: With experience in the use of abrasives in finishing. To seek new methods of improving the product. Box 7-155.

HELP WANTED MALE
SALES MANAGER

Young working metallurgist sales manager to take charge of New York steel distributors. Sales force of six men in metropolitan area. Selling stainless, toolsteel, special carbon bars and alloyed machinery steels. State age, experience, references and salary desired. Box MR-7, Metals Review

Alfred W. Gregg Dies Was Foundry Expert

Alfred W. Gregg, consulting engineer for the foundry equipment department of Whiting Corp., Harvey, Ill., died at Columbia Hospital, Milwaukee, on June 8 after a short illness.

Mr. Gregg was well known in the foundry industry, and had been with Whiting for the past 14 years. Prior to that he served in an executive capacity with various foundry organizations, including Bucyrus-Erie, Bonney-Floyd, and Farrell-Cheek Steel Foundry. He was a graduate of Purdue University, where he received his master's degree in 1904.

In addition to his A.S.M. membership, Mr. Gregg was active in the American Foundrymen's Society, serving as current chairman of the Chicago Chapter. He was awarded the J. H. Whiting Gold Medal of A.F.S. in 1944, and presented the American exchange paper before the International Foundry Congress in Amsterdam in 1949.

William E. Paulson

William E. Paulson, president of Thomas Paulson & Son, Inc., died unexpectedly in his sleep on May 31.

Mr. Paulson was a mechanical engineering graduate of Stevens Institute of Technology, class of 1904. For the next six years he held engineering positions with Westinghouse, Consolidated Gas Co. in New York, and as engineer on the Hudson River tunnel. In 1910 he joined Thomas Paulson & Son, Inc., organized by his father in 1883 for the manufacture of nonferrous castings. He became president of the concern in 1928.

Mr. Paulson organized the Metropolitan Brass Founders Association in 1911 and is a past director of the American Foundrymen's Society.

Howard M. Smith

Howard M. Smith, metallurgist at the Ambridge plant of Wyckoff Steel Co. for the past 26 years, died on June 2 as the result of an automobile crash. Mr. Smith was 54 years old, a member of the Pittsburgh Chapter A.S.M., and well known in steel metallurgical circles.

Chicago Office Moved

The Chicago office of Holcroft and Co. of Detroit has been moved to 4209 South Western Blvd. The move provides additional floor space and extra facilities for sales engineering, service and erection of the many kinds of heat treat furnaces that Holcroft supplies to industry. C. H. Martin, vice-president, is in charge of the Chicago office, while contact work will also be handled by A. A. Engelhardt.

Plating Courses Announced

The Joseph B. Kushner Electroplating School has inaugurated three intensive one-week summer lecture courses in special electroplating subjects, to be given in Stroudsburg, Pa., heart of the Pocono Mountains, nationally known vacation country. The course work, while intensive, will allow ample time for vacation activities. Subjects and dates are:

August 6—Modern Electroplating Principles

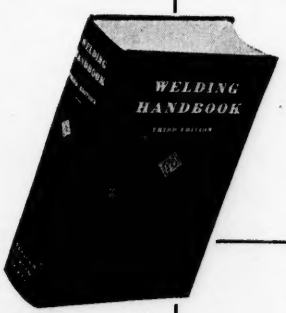
August 13—Gold Plating Techniques and Problems

August 20—Recent Developments in Electroplating.

Tuition fee is $30, which covers enrollment and original text material; enrollment for each of the three courses is limited to 20. Reservations must be placed prior to July 15 and should be addressed to Joseph B. Kushner, director, Joseph B. Kushner Electroplating School, 115 Broad St., Stroudsburg, Pa.

Cyanamid Has Open House

The Stamford, Conn., Research Laboratories of American Cyanamid Co. held open house for the public on May 19. Covering 410,000 sq. ft. of floor space, the laboratories provide research facilities for a wide variety of chemicals and plastics products manufactured by the company, including heat treating materials.



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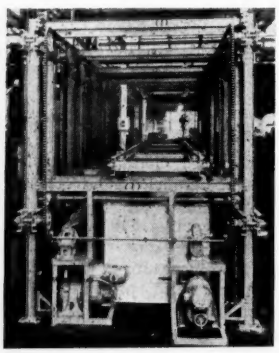

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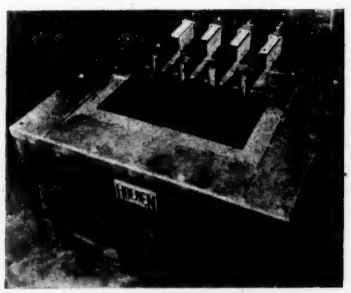
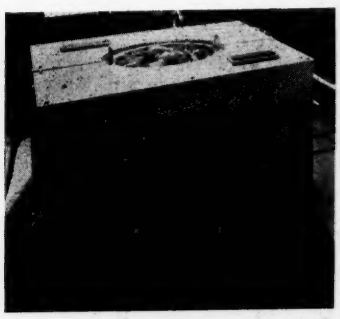
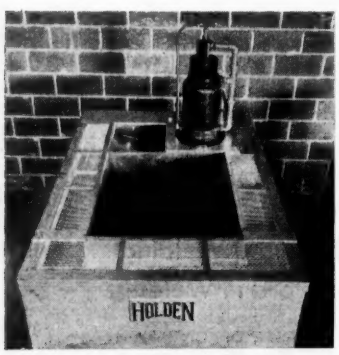


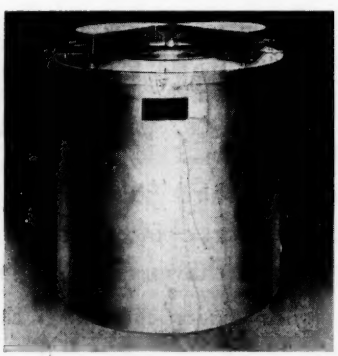
HOLDEN Electrode Furnace



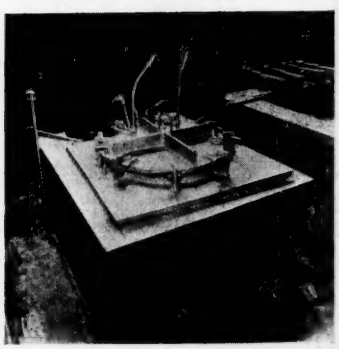
HOLDEN Gas-Fired Furnace



HOLDEN Marquenching or Austempering Furnace—Gas or Electric



HOLDEN Electric Resistance Furnace



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